EXCAVATIONS IN MAYURBHANJ

NIRMALKUMAR BOSE, M.Sc.
AND
DHARANI SEN, M.Sc.

UNIVERSITY OF CALCUTTA
1948

EXCAVATIONS IN MAYURBHANJ

NIRMALKUMAR BOSE, M.Sc.

AND

DHARANI SEN, M.Sc.

UNIVERSITY OF CALCUTTA
1948

Rs. 7/-

PRINTED IN INDIA

PRINTED AND PUBLISHED BY NISHITCHANDRA SEN,
SUPERINTENDENT (OFFG.), CALCUTTA UNIVERSITY PRESS,
48, HAZRA ROAD, BALLYGUNGE, CALCUTTA.

1681B—December, 1948—E.

CONTENTS

PREFACE

The work in Mayurbhanj was first undertaken by the Department of Anthropology, University of Calcutta in 1939-40; and the present report was prepared by about the end of 1942. On account of unavoidable circumstances, it was however not possible to have the report printed before the present academic year. Through the very kind permission of the Mayurbhanj State, the University is still carrying on some work in that area; and we hope to present the public with further reports when they are ready.

DEPARTMENT OF GEOGRAPHY,
UNIVERSITY OF CALCUTTA
The 2nd of October 1948.

NIRMALKUMAR BOSE
DHARANI SEN

FOREWORD

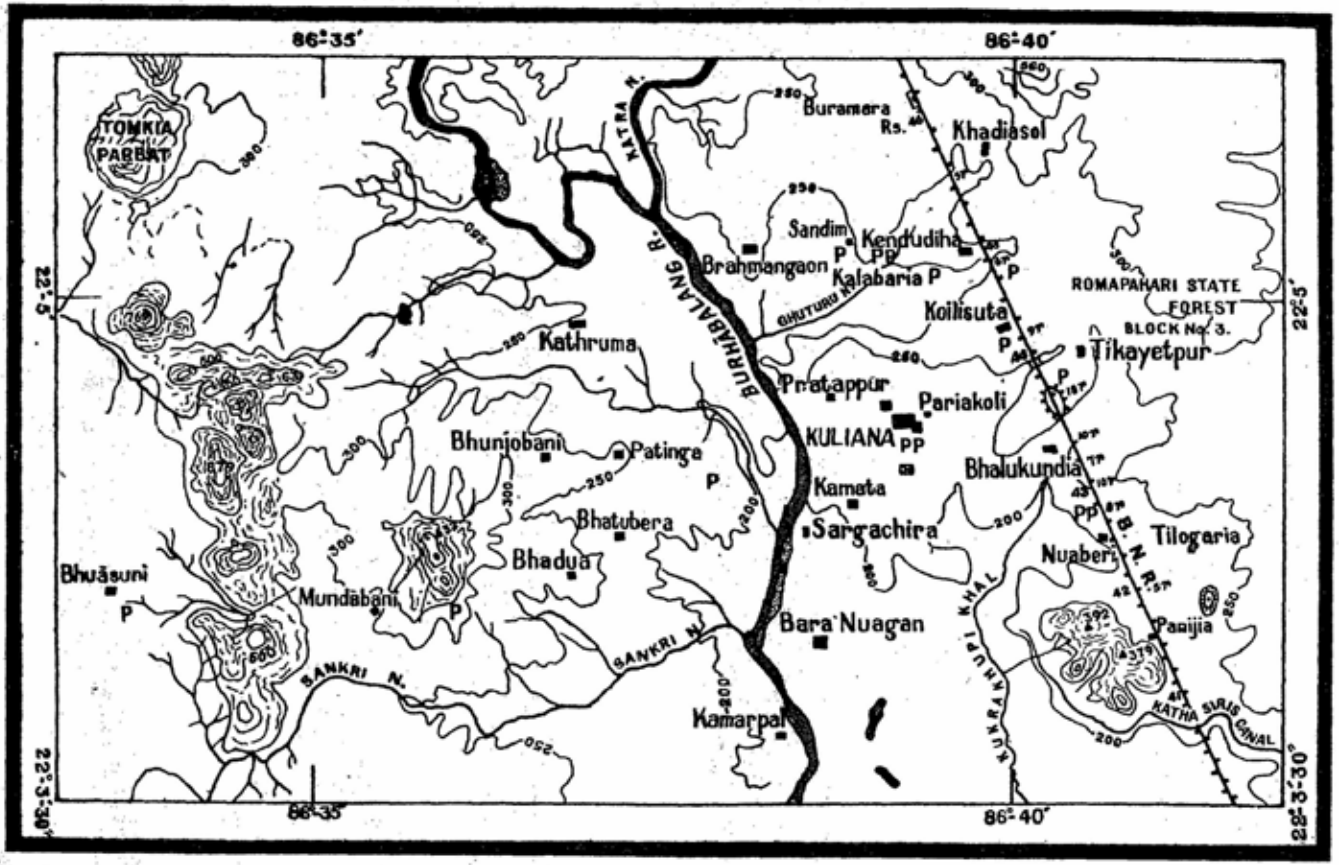
The excavations in Mayurbhanj were undertaken at the suggestion of Sri Nirmalkumar Bose who was then a member of the teaching staff of the Department of Anthropology. Sri Paramananda Acharya, State Archaeologist, Mayurbhanj, invited us to visit Baidipur where neolithic celts had been found, and also certain other areas where more archaeological finds might be expected. A short visit was paid by me and Sri Nirmalkumar Bose to Baidipur in the winter of 1938, when I went to Mayurbhanj to study Santals. Sri Nirmalkumar Bose arranged with Sri Acharya to visit the other sites later on during Easter. In the meantime, Mr. Worman. a research fellow from Harvard came to Calcutta and visited our Department. Sri Nirmalkumar Bose and Sri Dharani Sen very generously suggested that he should visit not only Baidipur but the other areas where more finds were expected. The subsequent history of the discoveries at Kuliana has been noted in the text by the authors and need not be reiterated.

Owing to lack of funds it has not been possible to extend our excavations to other promising sites, although the work is being continued with our limited resources.

Barring the work of this Department, no other prehistoric researches in the field have been carried out in this part of the country. A generous endowment in this direction can greatly help to fill in this gap in the past history of Eastern India, by extending our activity to other likely sites.

DEPARTMENT OF ANTHROPOLOGY,
UNIVERSITY OF CALCUTTA.

K. P. CHATTOPADHYAY,
University Professor and
Head of the Dept. of Anthropology.



1. Map of Kuliana and its neighbourhood. Scale 1″=1 mile. The letter ' P ' marks the position of palaeolithic sites.

[To face p. 1

I. DISCOVERY OF THE PALAEOLITHIC SITE AT KULIANA, MAYURBHANJ

1. Previous Work in Orissa

In 1876, V. Ball published an account of four stone-implements of palaeolithic type discovered by him in Bengal, Talcher, Dhenkanal and Sambalpur in the previous year. (Ball, *Proceedings of the Asiatic Society of Bengal*, 1876, pp. 122-123; quoted in part in R. D. Banerji, *History of Orissa*, i, pp. 27-28. See also Ball, *Jungle life in India*, 1880, p. 507 and plate I appendix B for illustration). Ball had also found implements of neolithic type in the neighbouring region of Dhalbhum, but no early worker had reported any finds from the State of Mayurbhanj itself.

2. First Notices of Mayurbhanj

In 1923-24, Mr. Paramananda Acharya, the State Archaeologist of Mayurbhanj, first drew the attention of Rai Bahadur Ramaprasad Chanda of the Archaeological Survey of India, to the fact that objects like the neoliths of the Indian Museum were often found in his native village named Baidipur (lat. 21°46′22″N, long. 86°41′54″E) within the Mayurbhanj State. A small collection was presented by him subsequently to the Indian Museum, and this was first referred to in the *Annual Report of the Archaeological Survey of India*, 1923-24 (pp. 100-101 and plate XXXV). Later on Prof. R. D. Banerji visited the site at Baidipur, as well as one at Khiching (21°55′N, 85°50′E) and a third locality on the Manada-Jashipur road, from where stone implements of several types had already been recovered by the Archaeological Department of the State. A brief account of these localities and of the implements collected there was given by Banerji in his *History of Orissa* (i, pp. 34-35), which was published posthumously in 1930. In it the author

expressed the opinion that Baidipur contained both neolithic as well as palaeolithic implements; he also threw out certain suggestions regarding possible cultural affiliations of the Mayurbhanj tools.

3. New Palaeolithic Sites Discovered by Acharya and Worman.

No further discoveries were however made for some time. In March of the year 1939, Mr. Eugene C. Worman (Jr.), a Research Fellow of the Harvard University, came to Calcutta in order to examine the collection of stone implements at the Indian Museum. He also spent two days at the University Museum of Anthropology; and it was suggested to him that he might spend a few days at Baidipur as well as at Chakradharpore in Singhbhum from where the University's collection of neoliths had been obtained. On the 25th of March 1939, Mr. Worman wrote from Chakradharpore to one of the members of the Anthropology Department:

"There is some of the finest lot of Palaeolithic in Mayurbhanj that I have seen anywhere..... I found about 6 new.....palaeo sites around Baripada and on the road leading North West from it to Rairangpur..... Name of place is Kuliana, 10 miles from Baripada....."

About a week afterwards, a letter dated Baripada, the 30th March 1939 (D. O. 1091A), was received from Mr. Acharya in which he stated:

"you will be glad to know that one neolithic site and three palaeolithic sites have been discovered the other day when Mr. Worman of the Harvard University came here. These sites are situated at places not far from Baripada. The Baripada Town itself is a palaeolithic site. About 4 miles north of Baripada is a site at Kuchai and at Kuliana 10 miles north of Baripada lies a palaeolithic site which was pronounced by Mr. Worman as a better site than any other in Southern India or C.P. At Amsikra about 4 miles south-west of Baripada is a neolithic and palaeolithic site."

Mr. Acharya informed us later on that Mr. Worman had wanted to see diggings within laterite beds. In 1936-37, two tanks had been excavated at Kuliana; and when Messrs. Acharya

and Worman visited one of them lying 150 yds. to the east of the police outpost at Kuliana in March 1939, it led to the discovery of one of the most important palaeolithic sites on this side of India.

4. Fresh Localities found near Kuliana

The Mayurbhanj State generously permitted the Calcutta University to carry on investigations at Kuliana, where two members of the staff spent a few days in April 1939, and again the period from 24th December 1939 to 31st January 1940. Further visits were made in December 1940, April 1941 and January 1942; and this resulted in extending Acharya and Worman's palaeolithic field at Kuliana to many of the neighbouring villages.

The village of Kuliana (22°4′N, 86°39′E) appears on the Survey of India Map No. 73 J/12, the scale being one inch to a mile. Kuliana is situated between 10 and 11 miles north-west of Baripada and has an inspection bunglow for the convenience of visitors. The situation of the neighbouring localities which have yielded further palaeolithic artifacts is given below; the co-ordinates do not refer to the villages themselves, but to localities where stone implements have been discovered in the neighbourhood: Kalabaria (22°5′20″N, 86°38′57″E), Koilisuta (22°4′40″N, 86°40′E), Nuaberi (22°3′35″N, 86°40′28″E), Pratappur (22°4′34″N, 86°38′22″E), Kendudiha (22°5′19″N, 86°39′12″E), Sandim (22°5′26″N, 86°38′22″E), Brahmangaon (22°5′26″N, 86°38′30″E), Buramara (22°6′31″N, 86°39′10″E), Patinja (22°3′45″N, 86°37′41″E), Mundaboni (22°2′50″N, 86°35′48″E), Bhuasuni (22°2′50″N, 86°32′30″E), Pariakoli and Kamata (same as Kuliana).

By a reference to the map, it will be observed that except for the localities of Mundaboni (4¼ miles) and Bhuasuni (7 miles) all the other sites are within a radius of three miles from the inspection bunglow at Kuliana.

5. Mode of Occurence

Many of the above villages are situated on laterite beds, often overlain by a short and variable thickness of soil. The

Public Works Department has sunk numerous pits in the soil to gather road-metal. These pits are from one foot to about 7 or 8 ft. in depth. They are known locally as *guri kadanh*. It was in course of these excavations that a large number of stone artifacts were unearthed from time to time. Many implements also lie scattered on the surface of the soil in the neighbourhood of the pits; but the fact that they are often encrusted with ferruginous matter proves that they have been derived from the underlying laterite.

In the villages of Koilisuta, Pratappur, Kendudiha, Patinja, Mundaboni and Bhuasuni tools were however recovered from the surface of the ground and not in pits, except in two minor instances at Koilisuta and Bhuasuni. The surface, in these instances, is uneven and strewn with blocks of quartzite of irregular shape. Sometimes well-flaked tools were discovered among them; or sometimes they lay in the dry pebble-strewn bed of streamlets, which are full only during the rains. A very small number of tools was also recovered from among perfectly rolled and rounded boulders or pebbles lying at the extreme margin of the bed of the Burhabalang river. These last specimens had evidently been derived from the high banks, and had also been subjected to a certain amount of rolling along with pebbles in the river-bed.

II. GEOGRAPHICAL AND GEOLOGICAL OBSERVATIONS AT KULIANA

6. Geographical Situation of Kuliana

By reference to the section drawn from above Kalabaria to a little south of the village of Darunia, it will be observed that the village of Kuliana is situated at an approximate elevation of 240 ft. and on a piece of ground which rises rapidly towards the north and slopes down to the south. The southern slope is rapid for some distance, after which it becomes gentler until the 150-foot line is encountered nearly six miles away. On the

II. Laterite plain with a shallow gravel pit in the fore-ground (see Sec. 5).

III. Gravel quarry at Nuaberi (see Sec. 4).

[To face p. 4

north, the rising ground culminates in a low ridge bounded on two sides by the 250-foot line and which extends approximately in an east-west direction ending on the banks of the river Burhabalang.

The river Burhabalang flows nearly three-fourths of a mile west of Kuliana; but the elevations and depressions from its bank to the 250-foot contour towards the east, all lie within the range of 50 ft. So they do not show in the contours present in the map. But from field observation, it was ascertained that just near the bank there is some high ground occupied by schistose quartzite and covered by thin jungle. This ground then rapidly slopes down to the east into paddy fields where there does not seem to be any laterite. The Baripada-Bangriposi Road is then crossed and one immediately encounters rising ground formed of laterite. There is a considerable accumulation of small boulders in certain places; this being the outcrop of a locally restricted bed of boulder conglomerate, which will be referred to later on. This lateritic area, where there are numerous pits for the collection of road-metal, is unsuitable for agriculture and has a thin covering of forest. Kuliana village stands practically in the midst of this patch of jungle, and on a flattish piece of ground.

As we proceed farther eastwards the village of Pariakoli is reached and then, after the laterite disappears once more, paddy fields take their place. These paddy fields are fed by a few small springs which issue from under the laterite of Kuliana. The fields themselves slope down towards the south-west. Farther away, the ground rises once more to the east, until the 250-foot line is touched. The railway line is then crossed, and the land rises higher and higher to culminate in the jungle covered uplands marked Romapahari State Forest Block No. 3 in the map. Isolated hills rising over a 100 ft. above the surrounding country are often encountered in this region.

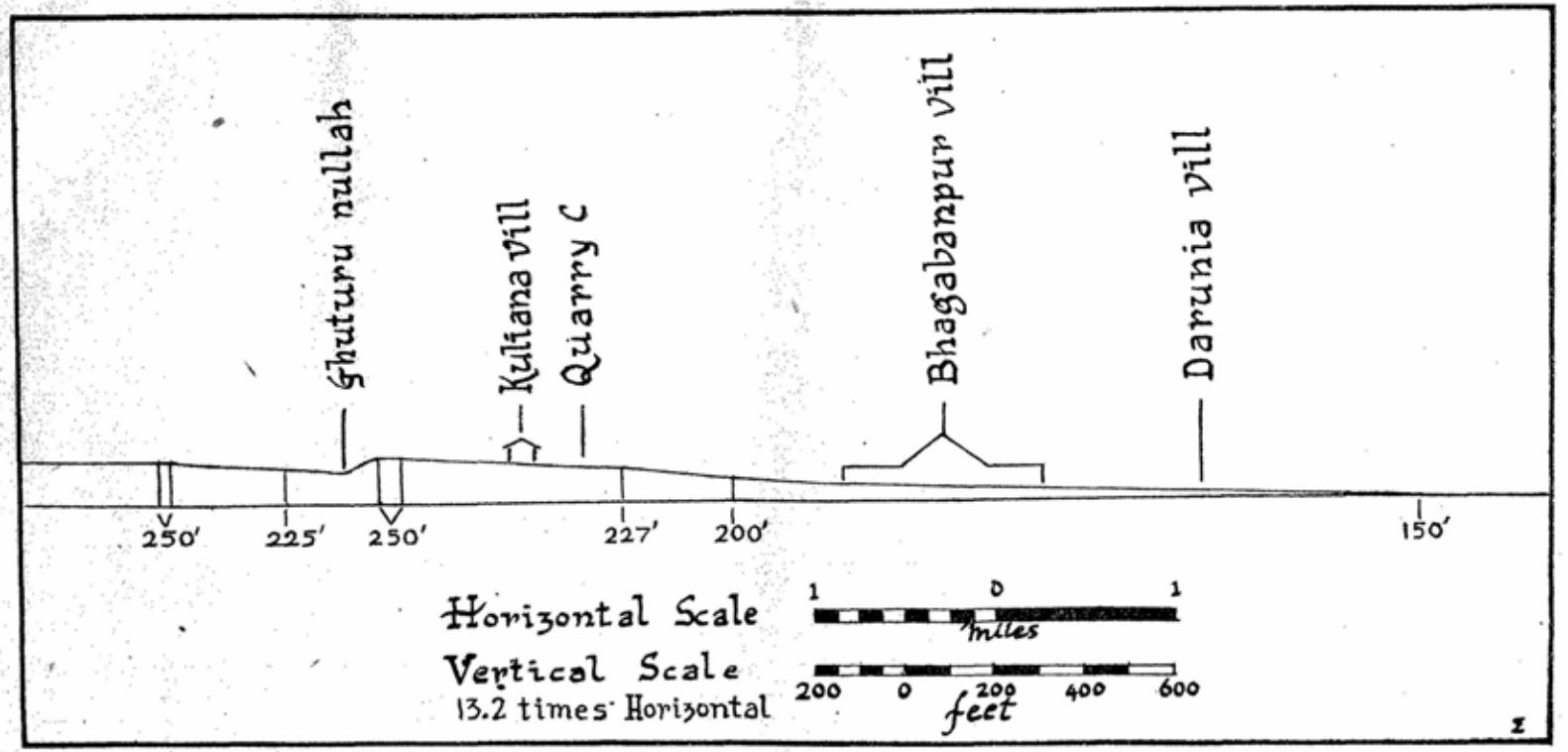
Kuliana thus stands on the southern slope of an elevated region and is also bounded in the east and west by paddy fields having lower elevation, and where laterite does not seem to occur as at Kuliana itself.

7. Solid Geology

Good sections of the country rock are exposed along the river Burhabalang and an idea of the neighbourhood can be formed from the two accompanying illustrations.

The country rock is Archaean in age. Its beds dip at angles between 38° and 45° towards the E by N and ENE. The river flows strictly along the strike of the beds between Brahmangaon and Kamata. Beyond Sargachira in the south, it enters alluvial country. The character of its course and of its flow are markedly altered below the village of Kamarpal.

On the right bank and away to the west, the hillocks of Patinja, Bhadua and Bhatuabera are quartzose talc-schist and quartz-phyllite. The river-bed near Pratappur, Kuliana and Kamata seems to be formed of quartz-schist and actinolite-schist. On the left or eastern bank, the underlying rocks are obscured for a small distance by alluvium. The latter is fairly deep in the immediate vicinity of the river, for a well sunk 33ft. in 1939 did not yet strike the harder rocks lying below. Hillocks of hard rock however stand out at Kamata and Pratappur. They are composed of schistose quartzite, interspersed in places by sheared conglomerates. Farther away to the east there is an isolated hill of quartzite at Chheliadungri near Tikaitpur. Beyond it several sections have been exposed in cuttings along the railway line. At Nuaberi and some portions of Tikaitpur, the rock is mica-schist which has become highly decomposed and also lateritised. To the north-west this gives place to mica-phyllite near Koilisuta. Occasional outcrops of granite gneiss occur at Sunsungaria near Tikaitpur; and it appears that the expanse of this rock increases as we proceed north along the railway line. In many places beside the line, dykes of dark dolerite cut across the country. These have weathered into spheroidal blocks, the surface of many of which has become more or less completely converted into ferruginous hydroxides having the outward appearance of laterite.



IV. The Location of Kuliana (see Sec. 6).

[To face p. 6

8. Section at Nuaberi

The geology of the quarry for road-metal at Nuaberi is of special importance to us. The laterite here is pisolitic and highly ferruginous all through the section exposed. In this quarry, a large number of good palaeoliths were discovered. Four were found *in situ*, being embedded in the side-walls of the quarry. The lowest depth at which tools were found was 1 ft. 11 in. and the upper depth 1 ft. 0 in. below the surface of the ground. Below this tool-bearing bed, the laterite shows an important feature, which was also observed in the tanks at Kuliana itself. This feature consisted in nearly horizontal lines formed by small tile-like concretions of iron ore stretching along certain portions of the formation. In one area a broken line of quartz fragments was similarly met with.

Nuaberi itself is a mound which rises about ten or fifteen feet above the paddy fields lying to the west. The quarry is set in the middle of the mound, while the railway line runs just by its side. The cutting is shown in the map a little below mile 43 on the line at a point marked 8r. This cutting reveals the true character of the Nuaberi mound. Between the telegraph posts marked 42/11 and 42/13 on the railway line, there is exposed a fine section of highly weathered mica-schist, which has been completely converted into pisolitic ferruginous laterite towards the top. There are also numerous veins of quartz, stretching in broken lines above the point. The occurrence of this quartz seems to be the reason why the mica-schist has not been completely weathered down, but stands out slightly above the neighbouring fields to the west in the form of a low spreading mound. Further sections of mica-schist weathering into laterite are also exposed towards the north between telegraph posts marked 43/2 and 43/3.

The Nuaberi section thus makes one thing clear. Much of the underlying laterite in the quarry is evidently of primary origin. The thin zone in which tools of human workmanship appear, occupying nearly 2 ft. from the ground level, is evidently of

secondary origin. The whole place was never under water, as that would have prevented lateritization of the mica-schists below. So it is presumed that the secondary laterite was firstly due to the distribution of concretionary ferruginous matter by rain-water in such a manner as to fill up the inequalities in the ground, and secondly due to the reconsolidation of these concretions by ferruginous matter once more.

9. Sections at Kuliana

Kuliana itself, as has been already stated, is situated upon the southern slope of an elevated region which is bounded on the east and the west by clayey soil in which there are paddy fields. The elevated region is formed of laterite, and is overlain by a superficial soil having a variable depth ranging round one foot.

There are altogether four tanks at Kuliana, and an extensive quarry for road-metal lying nearly quarter of a mile south of the inspection bunglow; the latter being actually situated within the administrative jurisdiction of Kamata village. This will be referred to as Quarry C. The tank in which Acharya and Worman made their first discovery of tools is Tank A. It is situated east of the Tahsildar's quarters and at a distance of about 150 yds. north-west of the inspection bunglow, and just south of the market place is Tank B. An old tank already existed at Kuliana to the north-west of Tank B, but its bed could not be examined. But another, belonging to Sj. Upendra Panigrahi of the village, which was found dry in April 1939, was carefully gone over from top to bottom. These last two tanks did not yield any human artifacts.

The above four tanks as well as Quarry C, give us a fairly good idea of the rocks underlying Kuliana. During our stay in April, 1939, the well at the police outpost at Kuliana was being re-excavated. It was obviously more than thirty feet deep, and the rock which was being brought up from the bottom appeared to be some form of decomposed schist. Unfortunately no samples were preserved for future examination.

V. Mica-schist weathering into laterite, near Tikaitpur (see Sec. 7.

[To face p. 8

From outward appearance, the lower reaches of both Tanks A and B, as well as that belonging to Sj. Upendra Panigrahi, present certain similarities with the primary laterite of Nuaberi quarry. There is the same frequency of irregularly linear arrangement of fragments of quartz as well as of the tile-like ferruginous concretions. The formation is moreover traversed by fissures, the sides of which show a greater concentration of ferrous material. At 20 ft. below the surface of the ground in Tank A, we encountered massive clay which was white and sticky. Its thickness could not however be determined.

10. An attempt was made to find out any possible mineralogical difference between the upper and lower layers of laterite. Samples were taken at intervals of one and, in some cases, two feet in the trenches dug by us in Tanks A and B. Altogether 25 specimens were subjected to panning and treatment by heavy solution in order to separate their heavy mineral content, if any. The results were negative, the following data being obtained :—

In Trench 1, Tank A Kuliana, at 7 ft. below ground level, quartz, muscovite and haematite occurred in the compact laterite bed, while at 4 ft. there occurred quartz, decomposed felspar and haematite. At 3 ft. again, muscovite reappeared along with quartz and haematite.

Similar results were obtained in the other trenches ; and these did not enable us to differentiate various levels of primary and secondary laterite, or even to find out where one ended and the other began.

11. Quarry C

This quarry yielded a very interesting section. It is situated near the southern extremity of the elevated region on which Kuliana stands. An abundance of palaeolithic tools was recovered from the quarry and its immediate neighbourhood. Two trenches were dug here, one being mainly horizontal, the other vertical. In both, after a variable thickness of pisolitic laterite, we encountered a bed of boulder conglomerate of unknown thickness.

The deep trench ran down to 12 ft. 6 in. Tools occurred between 2 ft. and 4 ft. only, but a split pebble was recovered from a depth of 9 ft. 0 in. The boulder conglomerate has a ferruginous matrix which is very compact and which shows the characteristic vermicular structure associated with laterite. There is one interesting feature about the boulders themselves. They are almost all of quartzite, having different grades of compactness. Some are fine-grained and friable, some are more coarsely granulated and harder. The shearing to which they had been subjected was different, consequently they were differently affected by processes of weathering. Besides the quartzite boulders and pebbles, one or two pieces of decomposed gneissose rock (?) and bluish igneous rock of the type met with in the dykes, were also recovered.

12. The locality where Quarry C stands is more than 30 ft. above the bed of the Burhabalang, and is never reached by even the highest floods of the river in modern times. An examination was carefully made of the boulders lying in the present bed of the river near Kamata and Sargachira. They were found to be of various sizes, but boulders of over 9 in. were quite common ; those lying near the eastern bank and some distance away from the present channel of the river being smaller. The boulders were mostly of quartzite, but a fair number were also of greenish or bluish trap, derived from the dykes which run across the country.

This is significant. The boulders obtained in Quarry C are generally of medium size and are almost wholly of quartzite. This would seem to indicate that this boulder bed is not the work of the Burhabalang itself but of some tributary nullah which flowed into it in former times from the eastern region and past the village of Kuliana towards its southern boundary.

13. An examination of the contours in the neighbourhood of Kuliana seems to favour the above conclusion.

To the east of the railway line, between latitudes 22°2′ and 22°5′, there is some high ground; and streams consequently flow from it towards the west to meet the Burhabalang river. The river itself flows in the neighbourhood of Kuliana along the strike

of the quartzite beds, but the eastern tributaries flow both against the strike and the dip of the beds lying between the river and the railway line.

The Ghuturu nullah is one of these creeks, and the upper portion of the Kukrakhupi khal is another. At the present moment, there is no creek flowing past Kuliana; but if we examine the contours carefully, it does not seem improbable that there was one flowing from near Tikaitpur past Kuliana village towards the Burhabalang in former times. Just near the 44th mile on the railway line, the 250-foot contour line shows a re-entrant pointing towards Tikaitpur. There is also a culvert at this point in the railway line indicating that water flows here during the rains. The 200-foot contour also shows a re-entrant between Kamata and Bhalukundia. It may be that the hypothetical nullah flowed from the neighbourhood of Tikaitpur down this point towards Balimundali and ultimately into the Kukrakhupi khal instead of the Burhabalang. Or it may also be that it flowed a little south of Kuliana, nearer Kamata, and then into the Burhabalang.

It is not improbable that the bed of boulder conglomerate in Quarry C is the work of the lost tributary of the Burhabalang. It was comparable to the Ghuturu nullah farther north, whose bed today is also strewn with quartzite boulders of smaller size than those of the river itself.

The occurrence of boulders along the Baripada-Bangriposi road just west of the elevated region at Kuliana (Section 6) may be due to a redistribution of the material during the making of the road.

14. Tools Recovered from Equal Depth, not necessarily of equal age.

Kuliana itself and its neighbouring region are thus made up of two kinds of rocks. There is primary laterite overlain by a variable thickness of laterite of secondary origin, this being in turn covered by a thin layer of superficial clay. A little south of the village, and also partly west of it, we strike across a bed of boulder conglomerate overlain by a variable thickness of secondary laterite.

The secondary laterite here was evidently laid under subaerial conditions, during which the stream in whose bed the

boulders were laid, disappeared and the matrix of the conglomerate was subjected to a process of lateritization. In Trench 1 Quarry C Kuliana, the boulder conglomerate was reached after about 6 ft. of pisolitic laterite, while in Trench 2 of the same quarry situated 40 yds. away, the same bed was struck often after less than 2 ft. of laterite. Inequalities in the original surface of the ground had therefore much to do with the thickness of lateritic accumulations in subsequent ages. We also saw how at Nuaberi, where there is no conglomerate bed as at Quarry C, but only primary and secondary laterite in a slight mound, all the in situ tools were confined to within 2 ft. from the surface of the ground.

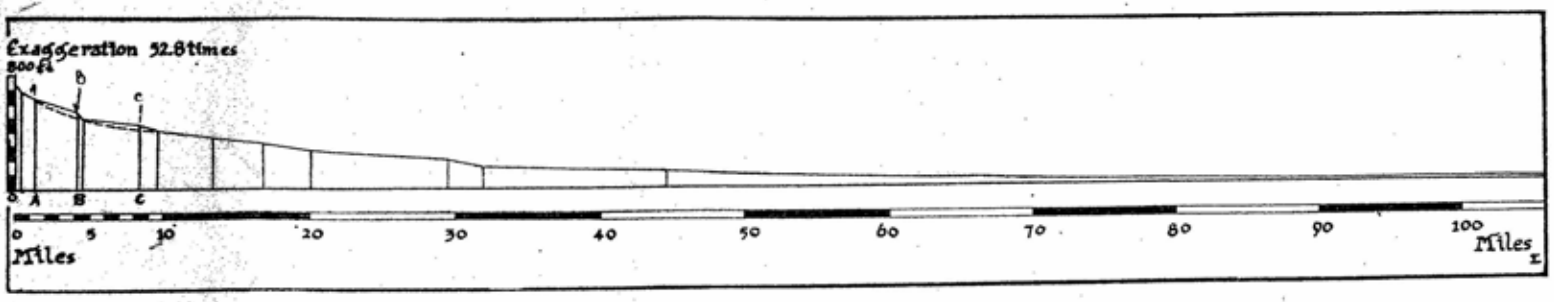
15. It can therefore be confidently stated that artifacts found at equal depths below the surface of the ground were not necessarily laid down at the same point of time.

If tools found at different depths within one pit of restricted horizontal extent are compared, we can reasonably fix their relative sequence; but tools recovered from equal depths even 50 yds. away from one another need not be contemporary.

16. Age of the Secondary Laterite

No fossil has hitherto been recovered from the detrital laterite in Kuliana. As long as further exploration or excavation does not yield any such material, the exact age of the bed will naturally remain obscure.

If the laterite plain of Kuliana had been a river-built terrace, then that would have been of some service to us. But as it is not so, being only an erosional plain resulting from the complete weathering down of various kinds of metamorphic rocks and a local redistribution of the lateritic material to fill in the inequalities of the surface of the ground—the whole process having taken place subaerially—the method of dating by means of river-terraces, which has been employed by Krishnaswami (*The Journal of the Madras Geographical Association*, 1938, xiii, part i, pp. 58-90) and Paterson (*Studies in the Ice Age in India and Associated Human Cultures*, 1939, pp. 327-330) in connection with the lateritic tracts near Madras, is ruled out in the present instance.



VI. Thalweg of the Burhabalang (see Sec. 18).

[To face p. 13

III. OBSERVATIONS IN CONNECTION WITH THE BURHABALANG RIVER

17. Dunn's Observations in the Neighbouring region of Singhbhum.

Dunn has recorded that the Subarnarekha river in a region in Singhbhum district, lying less than 20 miles from Kuliana, shows evidence of late Tertiary uplift. There are terraces on its banks and it has also cut down to a level 60 ft. below the basal gravel of an older alluvium. (Dunn, *Journal and Proceedings of the Asiatic Society of Bengal*, xxix, 1933, p. 285).

So a careful search was made in the Burhabalang river; but no satisfactory evidence was obtained of recent rejuvenation. There was proof of corrasion, but not of the degradation of the stream bed. No terraces were observed lying above the reach of the present river. A few pebble and boulder beds were noticed overlying clay, of the kind found above the Middle Miocene Ostrea limestones of Mahulia. There must have been uplift in this region after Middle Miocene times. But when this exactly took place, one cannot say. The boulder beds by the river bank could not again be satisfactorily equated with that found in Quarry C, south of Kuliana. So that the age of the latter remains as obscure as before.

Anyway, it may be of some use to record the observations, even if the results are of a negative kind.

18. Thalweg of the Burhabalang

Data for drawing the thalweg of the river over a restricted length were gathered from maps 73 J/8, 73 J/12, 73 K/9, 73 K/13 and 73K. The actual heights above sea-level of the lowest points in the river-bed could not be ascertained, so the thalweg is based on those points where a contour line crosses the river from one bank to another.

19. The thalweg is shown in the accompanying figure. The curve does not show any marked irregularity in its course of 102½ miles, which was actually subjected to examination. In course

of this distance, the river descends from a height of 750 ft. to almost sea-level. Slight discrepancies are noticeable at three points marked A, B and C. The first two are doubtful cases, the relative height of the bank could not be obtained from the maps in question in order to check how far the discrepancy is real. C however marks a spot where there are a number of rapids. It is not unlikely that in course of degrading its bed, the river has struck an outcrop of harder rock which has been responsible for the very slight irregularity in gradient.

Barring these three points, there is nothing in the thalweg to suggest any major disturbance within the area after the river had established a graded course; something comparable to the uplift recorded in the bed of the Narbada by Vredenburg. (Vredenburg, Pleistocene movement as indicated by irregularities of gradient of the Narbada and other rivers in the Indian peninsula, *Records of the Geological Survey of India*, xxxiii, pt. 1, 1906).

20. Outcrops of Unconsolidated and Consolidated Boulder Beds near the river.

Above the village of Kamata, the channel is confined to depressions along the strike of the metamorphic rocks; but below that village, it enters alluvial country and there is proof that its channel has shifted laterally from time to time.

At Kamata itself, a little away from the eastern bank, there is an exposure in which alluvium and thin boulder beds alternate with one another indicating that the strength of the current at this point has varied from time to time (Plate VIII). The exposure is covered over by high floods of the river in the rainy season.

Another outcrop of boulder conglomerate occurs in the bed of a small nullah opposite the village of Sargachira, a little above its junction with the river. Here the conglomerate is firmly attached to an outcrop of foliated quartz-schist. The boulders and pebbles are of quartz, the matrix is very compact, having a dirty brownish colour, but is not lateritised as in the boulder conglomerate in Quarry C (Sec. 11). The outcrop is not covered over by any other deposit, but is being rapidly denuded away by the samll stream in whose bed it lies exposed.

VII. Escarpment near Churgunia Ghat, Kamarpal (see Sec. 21).

VIII. Alternate beds of clay and of boulders near Kamata (see Sec. 20).

[To face p. 14

A little away from the junction of this stream, there is a thick bed of boulders overlain by alluvium on the western or right bank of the Burhabalang. The channel immediately below is deep, so the exposure could not be properly examined.

A third outcrop of compact boulder conglomerate occurs on the bank of the Sankri nullah, some distance above its junction with the Burhabalang. But here it is underlain by a sticky clay, white or yellow in patches. The depth of the latter could not be ascertained.

But by far the most extensive outcrop of boulder bed is met with from the junction of the Sankri, all along the right bank, up to a little beyond the village of Kamarpal, the length of the outcrop being nearly a mile, its thickness varying from 3 to 6 ft. There is a clear arrangement of pebbles and boulders of differing sizes in parallel lines; so that the strength of the stream must have varied while sections of the bed were being laid.

21. The Boulder Bed in Kamarpal

This outcrop was traced at right angles to the bank along a small nullah which flows into the river near Churgunia Ghat in Kamarpal. It extended up to a distance of 125 yds. after which it disappeared.

It is interesting to note that only the left bank of this nullah showed the boulder bed where it was overlain by alluvium. In the right bank it was absent; so the latter is half as high as the left bank. This seems to indicate that the boulders were laid down in patches by the shifting channel of the river, and even then they do not extend very far away from the bank.

22. It is highly significant that the bed in question lies wholly below the high-flood level of the river. That level is clearly marked on the face of the escarpment about 12 or 15 ft. above the upper limit of the bed. This region is occupied by alluvium which shows plenty of calcareous concretions throughout.

23. Lateral Swaying of the Channel

The river has therefore not appreciably deepened its course after it established its present slope.

The boulders were evidently laid down here, as well as at the other points noticed along the right bank, at a time when the channel occupied a more westerly course. It then probably swerved to the east, when the overlying alluvium was either laid down by itself, as in the exposure at Kamata, or by some of the small tributaries like the Sankri, which flow into it from higher ground on the west.

After the observed thickness of alluvium was laid down, the channel swung back once more to west, but not as far as its former limit; and this has exposed the boulders by lateral corrasion to a certain extent. This corrasion seems to be going on actively even now; for at one point, the bank was observed to have been sliced off by a few feet after the rains of 1941.

24. Beds lying below the Boulder Conglomerate

Under the boulder bed of Kamarpal, is a bed of greyish shale and also a sticky clay of unknown depth. Some plant fossils were collected in the shale by Sjt. Mukulchandra Basuroy, M.Sc., of the Presidency College; but they have so far not been described.

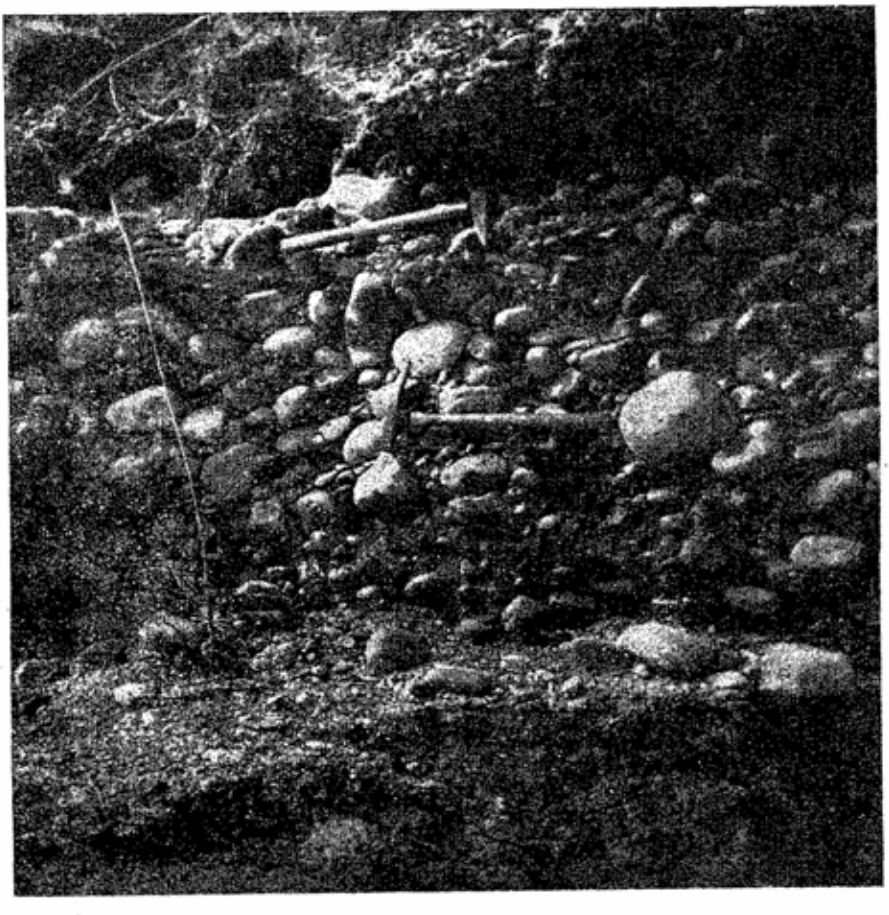
The outcrop is of the same appearance as the 'thinly stratified greyish white or very pale, green clays' found above the Ostrea beds at Mahulia by P. N. Bose (*Records of the Geological Survey of India*, xxxi, p. 168).

25. Matrix of the Boulder Bed

It is highly significant that the lower portion of the boulder conglomerate has a matrix exactly of the same nature as the underlying clay. Above, it is more like the overlying alluvium; but it is nowhere lateritized as in the case of Quarry C near Kuliana.

The character of the matrix below indicates that the deposition of the clay as well as of the pebbles and boulders proceeded simultaneously for some time. It is likely that the Burhabalang, with its varying load of pebbles and alluvial material, then discharged itself into some vaster sheet of water in the neighbourhood of Kamarpal. Later on, the marine (?) clay

IX. Outcrop of consolidated boulder-conglomerate below clay, at the base of the escarpment at Kamarpal (see Sec. 21).



X. Boulder bed underlain by a bed of clay (see Sec. 24).

[To face p. 16

was replaced by alluvium clearly brought in by the river. The sheet of water possibly then had receded more to the south and the east.

It is significant, in this connection, that there is no such clay between the boulder conglomerate and foliated quartz-schist opposite Sargachira; so that that region lay beyond the water under which the clay was being deposited.

26. It becomes therefore extremely important, from a purely geological point of view, to find the exact nature of the clay beds which have yielded plant fossils, and also the conditions under which the matrix of the boulder conglomerate was laid down.

The Ostrea beds of Mahulia and farther north, prove that the sea extended up to that point at least in Miocene times. But whether an arm reached right up to Sargachira and Kamarpal, where the Archaean beds seem to end, can only be established on the basis of the above examination.

27. Negative Results

At present the age of the boulder conglomerate of Kamarpal and its neighbourhood remains uncertain. They cannot also be equated with the bed exposed by excavation in Quarry C; the date of the latter thus remaining as obscure as before.

The river is of no help. So that, altogether, there is just nothing on which we can base the age of the detrital and sub-aerially deposited laterite of the elevated region in Kuliana and its immediate neighbourhood.

IV. CASES OF NATURAL FLAKING AT KAMARPAL

28. Natural Flaking in the Exposed Face of the Boulder Bed.

The bed at Kamarpal was carefully searched for human artifacts, but with no success. Pebbles of quartz were collected, and these had been naturally flaked or fractured. Some of them displayed flaking remarkably like that associated with artifacts of a crude type.

The flaking in the above cases was upon the exposed portion of the pebble only, the unexposed portion having escaped the treatment. The situation of the pebbles was such that they had caught the fall of loosened blocks of stone from above; and it was evidently this shower which had been responsible for the observed flaking.

29. One flaked piece was however of surpassing interest. It is shown in the accompanying plate. The original was a perfectly rounded and smoothened, flat, oblong boulder; and when first noticed, it lay upon one of its lateral margins. Part of the boulder was buried and part exposed. The exposed portion showed very fresh flake-scars, while one small region showed marks of numerous blows which had not however succeeded in detaching flakes. On extraction, it was found that the unexposed portion which lay within was unflaked, and resembled the unworked butt of an ovate. The lateral margin opposite the exposed one, *i.e.*, the side on which it rested upon boulders below, however showed flaking somewhat similar to the margin exposed to the shower of loose blocks from above.

It is perfectly possible that the underlying margin had been flaked by reaction produced from the surface of some boulder lying below. It should here be pointed out that no such flakes were found buried in the matrix below. The fact was that a large portion, nearly the whole flaked region of the boulder was sticking out of the matrix. The underlying matrix and the hypothetical 'anvil' had evidently been loosened and carried away before the specimen was first noticed.

The flaking on the two lateral margins does not show much of planning, random and irregularly placed strokes being more numerous than otherwise. There is moreover a concentration of strokes at the point immediately adjacent to the wall, *i.e.*, where falling stones would have first hit against the exposed margin. The flake-surfaces are moreover perfectly fresh, their intersections clearly defined and sharp, showing no trace of rolling before deposition in the bed. All this tends to make the operation of natural agencies a sufficient cause for the observed flaking. The

XI & XII. Naturally flaked boulder from the base of the escarpment of Kamarpal (see Sec. 28).

[To face p. 18

entire flaking is also not such as could not have been produced by the process described above.

Under these circumstances, we believe, it would be safer to assign the specimen to natural origin, than treat it as an object of human manufacture.

30. This means that the circumstantial evidence in each case of discovery is of very great importance. If the nature of the flaking is such that artificial origin is beyond dispute, then there is no trouble. But in every case where it is not beyond doubt, much can be gained by an examination of the circumstantial evidence. Unless we are convinced beyond trace of doubt that the object was artificially and not naturally shaped, it would be wiser to reject it than accept it as a human artifact.

The need of this caution will be more evident in the following chapter.

V. EXCAVATION AND TOOLS RECOVERED IN SITU

31. Tank A, Trench 1

This trench was located in the southern bank of Tank A. It was 96 ft. from a post A struck in the south-west corner of the tank. The datum line ran east to west, being 6 ft. in length. From the east end of the line, the distance to a point D, another post in the south-east corner of the tank was 58 ft.

The trench was dug up to a depth of 4 ft. only from the ground-level, in the form of a series of broad steps. The following section was encountered :—

(*a*) Overburden of yellowish earth, mixed more and more with fragments of pisolitic laterite as the depth increased. ... 23 in.

(*b*) Pisolitic laterite, not very compact and mixed frequently with small, irregular fragments of quartz and a few rolled quartz fragments. Some artifacts. ... 12 in.

Ku-A-55

In situ

(1)

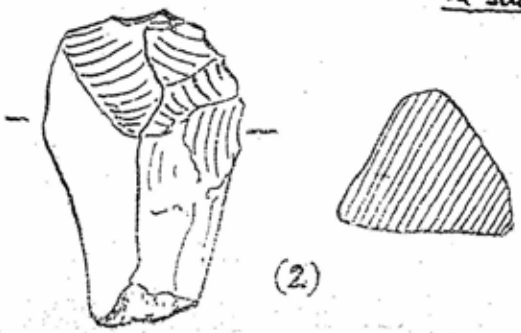
4 ozs.

L 4·6 cms.
B 5·0 "
T 3·2 "

MB
3-8-40.

Ku-A-54

In situ



(2)

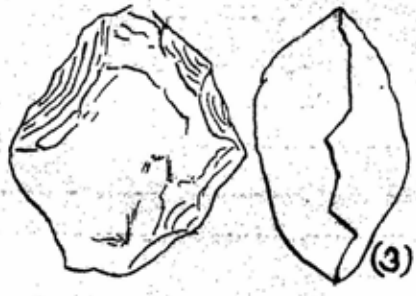
4½ ozs

L 7·6 cms.
B 4·8 "
T. 3·7 "

MB.
3-8-40.

Ku-A-47

In situ



(3)

1 1 ozs.

L 8·4 cms
B 7·9 "
T. 5·2 "

MB
3.8.40

(c) Pisolitic laterite, very compact, with very few quartz fragments. No artifacts. ... 13 in.

32. Tools from Tank A, Trench 1

(1) *Ku-A-55*: 7·6 cm. × 5·0 cm. × 3·2 cm.; 4 oz.; 2 ft. 9 in. W. of line EQ, 6 ft. 5 in. from EF. Depth 2 ft. 9 in.

Rock and Preservation—Fine-grained grey quartzite, strong ferruginous incrustation. Not rolled.

Primary flaking—Small thick tool with roughly parallel sides and obtusely pointed anterior. Right margin sharp and sinuous.

Secondary flaking—None.

Type—Small thick knife (?). (*D* I.)

(2) *Ku-A-57*: 7·6 cm. × 4·8 cm. × 3·7 cm.; 4½ oz.; 7 ft. 3 in. N. of point F. Depth 2 ft. 5½ in.

Rock and Preservation—Quartzite, rather friable due to weathering, deep stain and ferruginous incrustation. Not rolled.

Primary flaking—Ventral face and left of keel on the dorsal face are smooth pebble surfaces. Keel formed on dorsal face by one steeply sloping large flaking on the right. Anterior flake-scars slope down from the keel which ends a little above middle of tool.

Secondary flaking—A few doubtful ones, irregularly placed in the anterior portion.

Type—End-scraper on pebble. (*I* III.)

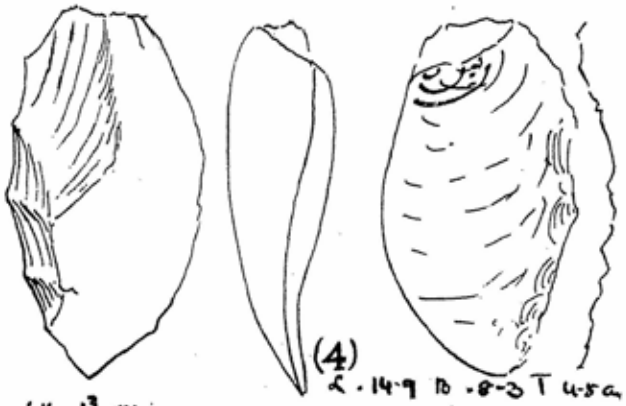
(3) *Ku-A-47*: 8·4 cm. × 7·9 cm. × 5·2 cm.; 11 oz.; found just under the overburden and not embedded in the laterite. Depth 1 ft. 3 in.

Rock and Preservation—Grey quartzite, stained brown. Not rolled.

Primary flaking—Trimmed to thick discoidal form. Flaking confined to convex right margin of dorsal face and whole of ventral face. Left lateral margin thick, suitable as a holder.

Secondary flaking—Near the right convex working edge, there are a few deep step-fractures, which may have resulted from strong vertical blows dealt with the tool.

Ku-A-74 In situ



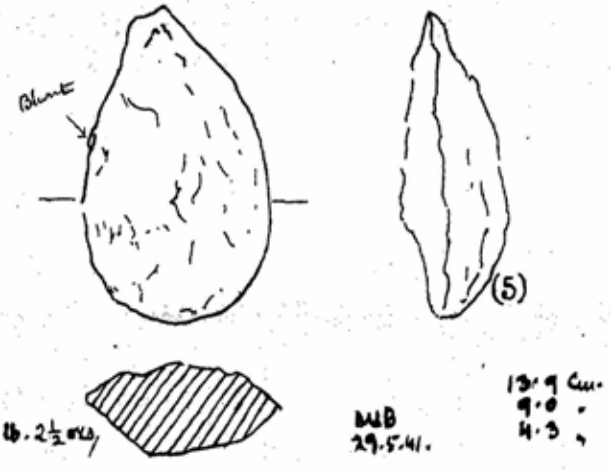
(4)

L. 14·9 B. 8·3 T 4·5 cm.

Lb. 1¾ ozs.

MKB
4·8·40

Ku-A-87 In situ



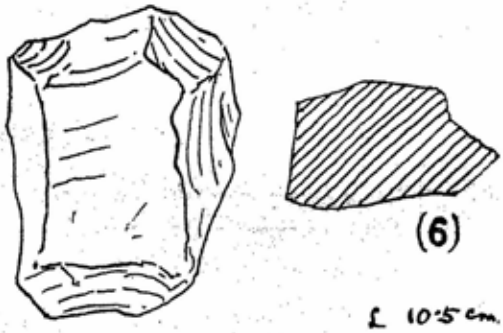
(5)

13·9 Cm.
9·0 "
4·3 "

Lb. 2½ ozs.

MKB
29.5.41.

Ku-A-94 In situ



(6)

L 10·5 cm.
B 8·4 "
T 4·3 "

Lb. , 1½ ozs.

MKB
3·8·40

Type—Thick discoidal chopper, with holder and convex margin opposite. (*A* II *a*.)

33. Tank A, Trench 2

This was located in the western bank of the tank. The datum line $\alpha\beta$, 7 ft. in length, was laid north-south by compass. The line Aα was N. by 12°E.

As in Trench 1, after an initial layer of overburden, pisolitic laterite was encountered for a considerably greater thickness than in the former. The very compact layer which was reached at about 4 ft. in Trench 1 was reached here at about 6 ft. below ground level. The distribution of fragments of quartzite is given below :

Depth 1 ft. to 1 ft. 11 in.—Rounded pebbles—4 from 3·2 to 7·0 cm.
Angular fragments—2 from 4·4 to 5·1 cm.
Flakes —Nil.

2 ft. to 2 ft. 11 in.—Rounded pebbles—10 from 1·9 to 6·3 cm.
Angular fragments—19 from 2·5 to 1·27 cm.
Flakes —5 from 3.8 to 8·9 cm.

3 ft. to 3 ft. 11 in.—Rounded pebbles—6 from 3·8 to 12·1 cm.
Angular fragments—7 from 3·8 to 7·6 cm.
Flakes —Nil.

4 ft. to 4 ft. 11 in.—Rounded pebbles—3 from 3·2 to 4·4 cm.
Angular fragments—3 from 5·1 to 6·3 cm.
Flakes —Nil.

5 ft. to 5 ft. 11 in.—Rounded pebble (?)—1 of 3·8 cm. length.
Others —Nil.

34. It will be observed that the greatest concentration of quartzite fragments, both angular and rounded, was between 2 ft. and 2ft. 11 in.; and this was also the layer in which a few flakes were recorded. They may have been waste products from the manufacture of tools, or otherwise.

35. Tools from Tank A, Trench 2

(4) *Ku-A-74*: 14·9 cm. × 8·3 cm. × 4·5 cm.; 1 lb. $1\frac{3}{4}$ oz.; 3 ft. 10 in. N. of α. 11 ft. $8\frac{1}{2}$ in. E. of $\alpha\beta$. Depth 4 ft. 7in.

Rock and Preservation—Quartzite, stained brown. Not rolled.

Primary flaking—Upper surface is original, smooth and rolled, ventral face is one flake-surface. Unifacetted striking platform makes $\pm \angle 115°$ with ventral face. A more or less tongue-shaped and pointed large flake was thus first struck off from a rolled boulder, and then retouched.

Secondary flaking—Right margin being formed by a sharp intersection of ventral flake-scar with cortex on dorsal face needed no retouch. But the left lateral margin was carefully retouched by free-flaking on both faces. Anterior tip is sharp and unretouched.

Type—Pointed knife on large flake. (*D* III *a*.)

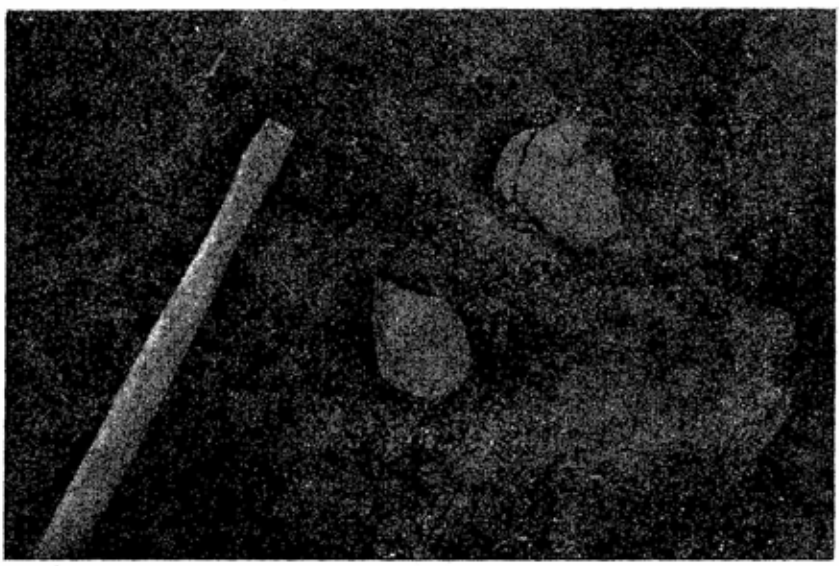
(5) *Ku-A-87*: 13·9 cm. × 9·0 cm. × 4·3 cm.; 1 lb. $2\frac{1}{2}$ oz.; 6 ft. 6 in. E. of $\alpha\beta$, 4 ft. 7 in. S. of northern boundary of trench. Depth 3 ft. 3 in.

Rock and Preservation—Vein-quartz, no portion of original cortex visible. Not rolled. Slightly injured at tip during excavation.

Primary flaking—Completely worked over both faces to produce amygdaloidal form of medium thickness. Inter-flake margins are not very clear, this being partly due to the nature of the rock and partly to the closeness of the primary strokes. Both faces without midrib, and of medium convexity.

Secondary flaking—Numerous along the margin, many being of a stepped character.

XIII. Dry bed of Tank A, Kuliana (see Sec. 31).



XIV. An artifact just after excavation (see Sec. 36).

[To face p. 25

Type—Amygdaloidal biface. (*G* II *c* ii.)

(6) *Ku-A-97*: 10·5 cm. × 8·4 cm. × 4·3 cm.; 1 lb. 1½ oz. 2 ft. 6 in. S. of northern boundary of trench, 3 ft. 2 in. E. of $\alpha\beta$. Depth 2 ft. 11½ in.

Rock and Preservation—Flaggy variety of quartzite. Deep red patches and some ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to irregular quadrilateral form. Thickest in the middle. Left margin and posterior thick and nearly upright. Anterior is convex, sharp, sinuous.

Secondary flaking—None.

Type—Irregular transverse cleaver. (*H* II *a*.)

36. Other Tools dug up in Tank A

(7) *Ku-A-66*: 11·8 cm. × 9·8 cm. × 8·7 cm.; 3 lbs. 2 oz.; 32 ft. 4 in. E. of point F. From here 16 ft. 9 in. N. by 10°E. Depth 4 ft. below ground level.

Rock and Preservation—Quartzite, stained in patches. Not rolled.

Primary flaking—Irregular polyhedral form. Original cortex present in patches. One slightly convex sinuous lateral margin present, this having been produced by irregular alternate flaking. Opposite lateral margin is thick and upright, suitable as holder.

Secondary flaking—Some deep step-fractures have been produced above the sinuous edge, apparently due to heavy vertical blows dealt with tool on hard surface.

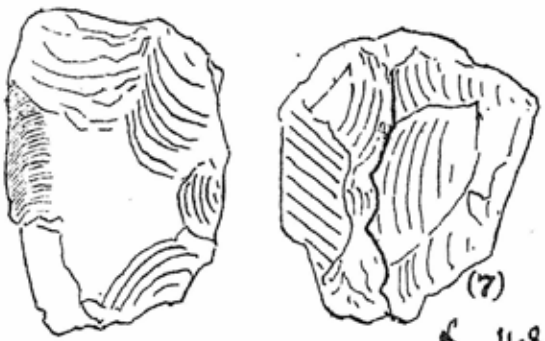
Type—Side-chopper of crude heavy type with slightly convex margin and upright holder opposite. (*B* II *a*.)

(8) *Ku-A-45*: 15·2 cm. × 7·6 cm. × 4·7 cm.; 10 oz.; 34 ft. 6 in. N. of S-E corner of tank. Depth 2 ft. 10 in.

Rock and Preservation—Light grey quartzite, with ferruginous patches. Not rolled.

Primary flaking—Trimmed to a flattish spindle shape. Pointed at both ends, middle and posterior thick,

Ku-A-66 In situ

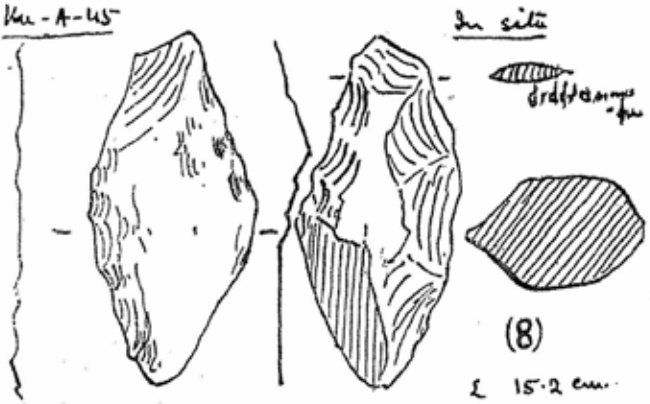


(7)

L 11·8 cm
B 9·8 "
T. 8·7 "

X 3 Lbs. 2 ozs. MB 21·10·40.

Ku-A-45 In situ

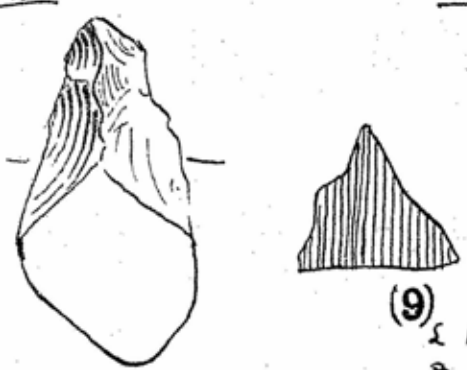


(8)

L 15·2 cm.
B 7·6 "
T 4·7 "

10 ozs. MB. 3.8.40.

Ku-A-8 In Situ



(9)

L 12·1 cm.
B 7·6 -
T 6·6 -

1 lb. 4 ozs. MB 2.8.40

anterior thin and obtusely pointed. Right and left margins sharp in the anterior portion and nearly straight.

Secondary flaking—None present, except some stepped flaking in the middle of the lateral margin, which may have been due to use.

Type—Long, narrow, thick spindle-shaped biface with thin and broad anterior, pointed posterior. (*G* III.)

(9) *Ku-A-8*: 12·1 cm. × 7·6 cm. × 6·6 cm.; 1 lb. 4 oz.; 38 ft. W. of N-E corner of tank, thence 4 ft. 3 in. S. Depth 2 ft. 9 in.

Rock and Preservation—Grey quartzite, speckled with ferruginous stains and incrustation.

Primary flaking—Pebble butt, original cortex also present in the anterior portion of ventral face. Roughly triangular form with a steep triangular cross-section in the anterior. Flaking extensive and deep. The keel on the dorsal face is sharp and shows some small flakings in one portion. This is probably the working edge.

Secondary flaking—None.

Type—Tool on pebble, with the dorsal keel turned into a sharp edge. Resembles crude rostroid hand-axe. Used for chopping or digging.(?)

(10) *Ku-A-48*: 9·5 cm. × 6·3 cm. × 3·3 cm.; 6¾ oz.; 11ft. 5 in. N. of EF line, 1 ft. 5 in. W. of CE. Depth 2 ft. 5½ in.

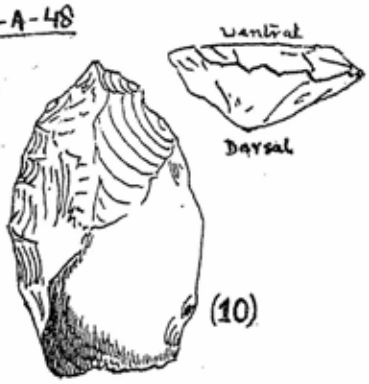
Rock and Preservation—Quartzite, fairly strong ferruginous incrustation. Not rolled.

Primary flaking—Roughly oval form with nearly flat ventral face, and convex dorsal face. Posterior portion of dorsal face is formed by original crust. Both lateral margins are convex and meet anteriorly in a thin, not very acute point.

Secondary flaking—Some stepped retouches are present at the left anterior margin.

Type—(Small biface) Point. (*J* I.)

Ku-A-48 — In Situ.

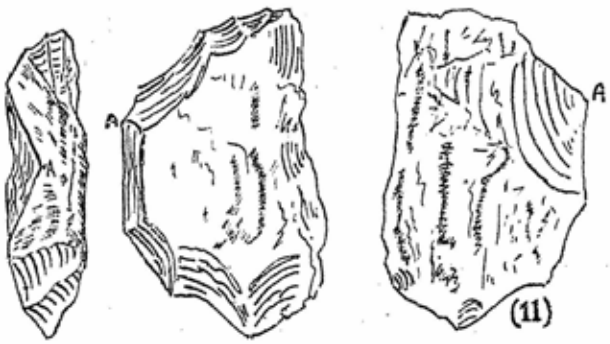


L 9·5 cm
B 6·3 "
T 3·3 "

6 3/4 ozs.

MMB.
3-8-40

Ku-B-23 — In Situ



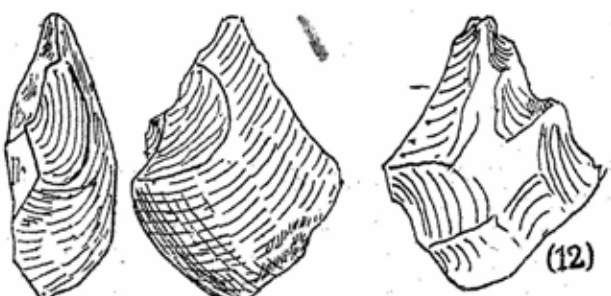
Side-Scraper

L. 10·3 cm B. 6·8 cm T. 2·6 cm

8 3/4 ozs.

N.K.B
13-1-40

Ku-B-21 — In Situ



L. 8·4 B. 7·5 T. 3·6 cm.

6 3/4 ozs.

N.K.B.
13-1-40.

37. Excavations in Tank B

Two trenches were dug here, of which only the second yielded a few artifacts. The section exposed was somewhat like that of Tank A, with the difference that after about 4 ft. below the datum level, water was encountered and so no further excavation was possible. The following list of quartzite fragments recovered, gives an idea of the level where these are most frequently met with; this being between 1 ft. and 2 ft. below ground level.

Depth 1 ft. to 1 ft. 11 in.—Rounded pebbles and boulders—48 from 1 in. to $1\frac{3}{4}$ in., 8 from $2\frac{1}{2}$ in. to 7 in.
Subangular fragments—15 from $\frac{3}{4}$ in. to $2\frac{1}{2}$ in., 4 from $3\frac{3}{4}$ in. to $5\frac{1}{2}$ in.
Angular fragments—9 from $1\frac{1}{2}$ in. to 3 in.

Depth 2 ft. to 3 ft.—Rounded pebbles and boulders—14 from $1\frac{3}{4}$ in. to $7\frac{1}{2}$ in.
Subangular fragments—34 from $1\frac{1}{2}$ in. to 4 in.
Angular fragments —15 only.

38. Tools recovered from Tank B

(11) *Ku-B-23*: 10·3 cm. × 6·8 cm. × 2·6 cm.; $8\frac{3}{4}$ oz., exact position unrecorded, but depth was between 3 ft. 5 in. and 4 ft.

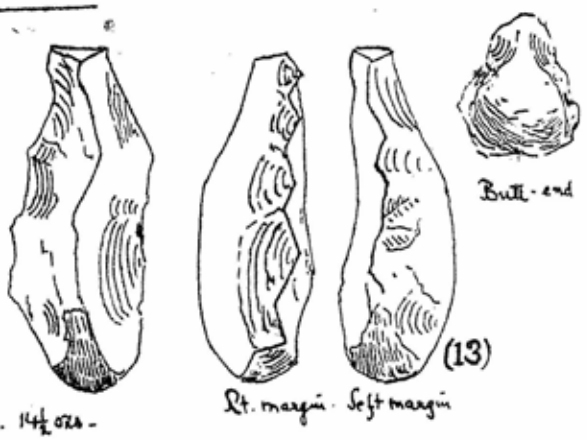
Rock and Preservation—Flaggy grey quartzite, with prominent joint planes. Red stain in patches. Not rolled.

Primary flaking—Trimmed to a flat, roughly semicircular form. Dorsal face formed of an elevated central plane from which small primary flake-scars slope down towards margin. Ventral face is nearly flat, produced partly by fracture along joint planes. Convex margin is jagged.

Secondary flaking—None; but the straight lateral margin shows a few step-fractures, which may have been due to use as chopper.

Type—Semicircular biface with jagged convex margin. May be side-scraper. (*I* 1 *a*.)

Ku-B-14 In Situ



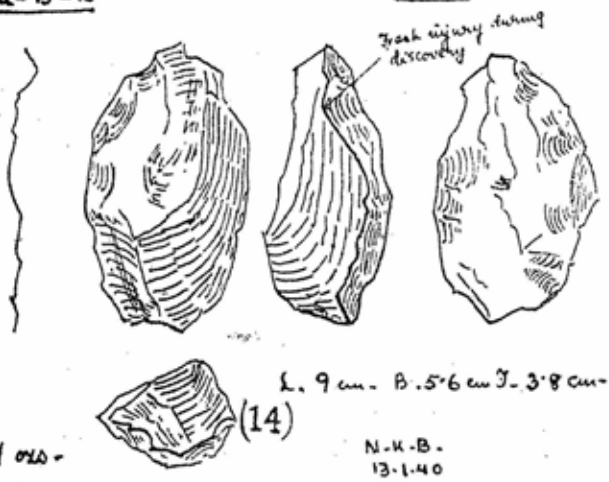
(13)

2 lbs. 14½ ozs.

L. 19·9 B. 8·9 T. 3·4 cm.

N.K.B.
12.1.40

Ku-B-15 In Situ



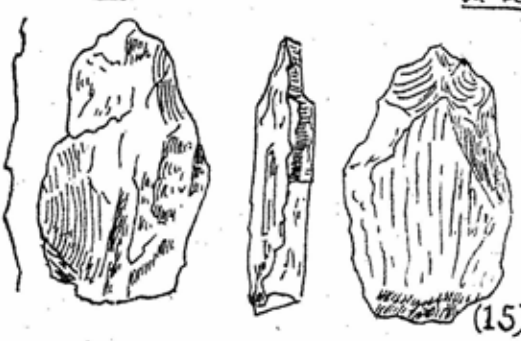
(14)

L. 9 cm. B. 5·6 cm T. 3·8 cm.

7 ozs.

N.K.B.
13.1.40

Ku-B-16 In Situ



(15)

L 12·5 B. 8·9 T. 3·4 cm.

15¼ ozs.

N.K.B
13.1.40

(12) *Ku-B-21* : 8·4 cm. × 7·5 cm. × 3·6 cm. ; 6¾ oz. ; 3 ft. 3 in. W. of eastern margin of trench, 1 ft. 6 in. S. of northern margin. Depth 2 ft. 7 in.

Rock and Preservation—Greyish yellow quartzite, mottled with red ferruginous patches and incrustations. Not rolled.

Primary flaking—Trimmed to roughly quadrilateral form, thick pebble butt and thin pointed apex. Dorsal face is almost wholly formed by original cortex, with one deep flake-scar on the left. Ventral face worked all over, leaving an eminence in the middle.

Type—Pointed tool on pebble, may be borer. (*J*)

(13) *Ku-B-17* : 19·9 cm. × 8·9 cm. × 3·4 cm. ; 2 lbs. 14½ oz. ; 1 ft. 7 in. W. of eastern wall, 4 ft. 9 in. N. of southern wall. Depth 2 ft. 2½ in.

Rock and Preservation—Greyish quartzite, mottled red with ferruginous patches. Not rolled.

Primary flaking—Long boulder trimmed in such a manner as to have a steep triangular section throughout, except at the pebble butt. Ventral face has a very low midrib, while the dorsal has a very high keel. Anterior truncate, may have been broken. Lateral margins deeply sinuous.

Secondary flaking—None.

Type—Rostroid hand-axe of long form. (*F*)

(14) *Ku-B-15* : 9 cm. × 5·6 cm. × 3·8 cm. ; 7 oz. ; 5 ft. 9 in. W. of eastern margin of trench, 1 ft. 4 in. W. of southern margin. Depth 1 ft. 8¾ in.

Rock and Preservation—Yellowish grey quartzite, mottled red with ferruginous incrustations. Not rolled.

Primary flaking—Trimmed to oval form, both faces being irregularly convex. Dorsal face has a large portion of original cortex. Ventral face worked all over, particularly along the margins. Lateral margins convex, obtuse and thick anterior, left margin sharper than right.

Secondary flaking—None.

Type—Thick and crude oblong biface. (*G* II *e* i.)

(15) *Ku-B-16* : 13·5 cm. × 8·9 cm. × 3·4 cm. ; 15¼ ozs. ; 5 ft. 9 in. W. of eastern margin , 1 ft. 4 in. N. of southern margin. Depth 1 ft. 8¾ in.

Rock and Preservation—Flaggy quartzite, grey, mottled with red ferruginous patches and concretions. Not rolled.

Primary flaking—Trimmed to irregular oval form, unworked butt, obtuse apex. Dorsal face has faint midrib. Flakings irregular, generally disposed along the margin. Ventral face flat, due to fracture along joint plane.

Secondary flaking—None.

Type—Irregular ovate biface. (*G* II *e* i.)

39. Excavations in Quarry C, situated within the Boundary of Village Kamata.

The sections exposed in the two trenches dug here have already been discussed in Secs. 11 and 12. The first trench was situated in the eastern margin of the quarry, while the second was in the western margin. The following table will give an idea of the pieces of quartzite recovered from the lateritic matrix :—

Ground level to 2 ft.—Rounded pebbles—5·8 cm. to 10·4 cm.—5.
Angular fragments—3·7 cm. to 14 cm.—15.
Angular chips of rounded pebbles —3·9 cm. to 7·7 cm.—8.
Flakes — 12 cm. —1
3·9 cm. to 8 cm.—8.

2 ft. to 3 ft. —Rounded pebbles—3.2 cm. to 17 cm. —42.
Angular fragments—2·4 cm. to 11·2 cm.—109.
Angular fragments of rounded pebbles—3·3 cm. to 11·3 cm.—30.
Flakes and thin chips, many with bulbs of percussion (possibly waste flakes) —2·2 cm. to 12·5 cm.—53.

XV. Excavation in Quarry C, Kamata (see Sec. 39).

[To face p. 33

3 ft. to 4 ft. 5 in. —Rounded pebbles—3 cm. to 13·8 cm.—74.
Angular fragments—2·1 cm. to 7·3 cm.—30.
Angular fragments of rounded pebbles—3·6 cm. to 6·3 cm.—12.
Flakes (hardly any with bulb of percussion)—1·8 cm. to 3·3 cm.—8.
Big pieces—15·5 cm. to 33 cm.—3.

4 ft. to 6 ft. —Numerous pebbles from 2·5 cm. to 5·2 cm.

6 ft. and beyond —The whole pit has become converted into a pebble bed. The matrix is lateritized and shows the characteristic vermicular structure.

12 ft. 6 in. —The same character continues, the pebbles are larger and more difficult to dislodge from the matrix.

The line between the pisolitic laterite and boulder conglomerate bed is not sharply defined.

40. Artifacts from First Trench, Quarry C, Kamata Village.

(16) *Ku-C-14* : 18·8 cm. × 12·2 cm. × 8·7 cm. ; 4 lbs. 0½ oz. ; 1 ft. 5 in. W. of eastern edge, 2 ft. 8 in. N. of southern edge. Depth 9 ft. 10 in.

This tool was recovered from the boulder conglomerate bed, where it lay in the midst of boulders and pebbles, all of which were perfectly rounded; only this one showed deep fractures on one face. The circumstantial evidence was thus in favour of its being an artifact. It is moreover noticeable that, although lying in a boulder bed, the intersection of the flake-scars do not show any sign of having been dulled by rolling.

Rock and Preservation—Quartzite. Not rolled.

Primary flaking—Large pear-shaped boulder of which one face only is trimmed. One lateral margin is thick and

Ku-C-14 in situ

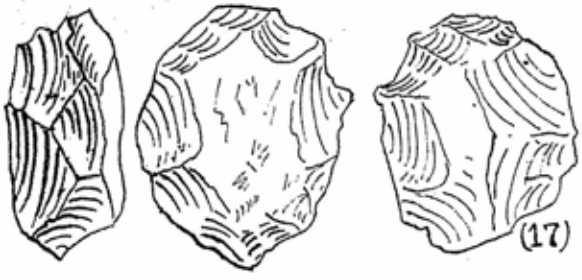
(16)

L 18·8 cm
B 12·2 "
T 8·7 "

4 lbs. $\frac{1}{2}$ oz.

M B
18.9.40.

Ku-C-3 in situ



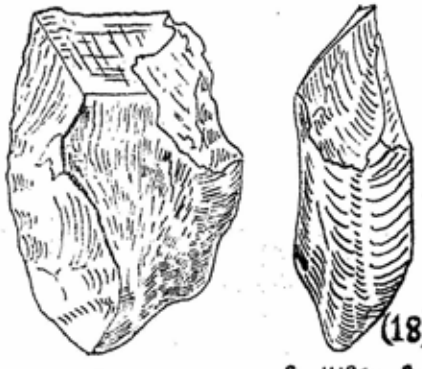
(17)

Discoid tool on core L. 9·0cm. B. 7·0cm. T. 5·7cm.

12$\frac{1}{4}$ ozs.

N.K.B.
13.1.40.

Ku-C-2 in situ



(18)

cleaver-like pebble tool. L. 11·8cm. B. 8·0cm. T 4·6

1 lb. $\frac{3}{4}$ oz.

N.K.B.
13-1-40

nearly upright. The opposite lateral margin shows a few deep step-fractures and also some shallow flake-scars towards the anterior.

Type—Large heavy side-chopper on a boulder, with straight working edge. (*B* II *b*.)

(17) *Ku-C-3*: 9·0 cm. × 7·0 cm. × 5·7 cm.; 12¼ oz.; 10 in. W. of eastern margin, 10 in. S. of northern margin. Depth 3 ft. 5½ in.

Rock and Preservation—Fine-grained quartzite, yellowish brown, with ferruginous concretions. Not rolled.

Primary flaking—Trimmed to thick discoidal form. Dorsal face has lofty irregular eminence in the middle, from which flake-scars slope away on all sides. Ventral face is flatter, and has a low midrib. Margin continuously jagged, with a deep pitch.

Type—Thick discoidal chopper. (*A* II *a*.)

(18) *Ku-C-2*: 11·8 cm. × 8·0 cm. × 4·6 cm.; 1 lb. 0¾ oz.; 1ft. 10 in. W. of eastern margin, 3 ft. S. of northern margin. Depth 2 ft. 9½ in.

Rock and Preservation—Coarsely crystalline quartzite pebble, red ferruginous stain and very slight incrustation. Not rolled.

Primary flaking—Of roughly rectangular form. Whole of ventral face and a large portion of the posterior as well as middle of the dorsal face are original. Left and right margins of dorsal face are irregularly flaked. A flat sloping flake-scar in the dorsal anterior intersects the ventral face to form transverse working edge.

Secondary flaking—None.

Type—Transverse cleaver on pebble. (*H* II *b*.)

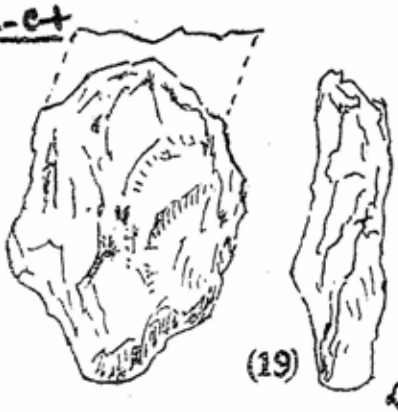
(19) *Ku-C-1*: 13·9 cm. × 10·1 cm. × 4·5 cm.; 1 lb. 3½ oz.; 6 ft. 1 in. W. of eastern margin, 2 ft. 8 in. S. of northern margin. Depth 1 ft. 11 in.

Rock and Preservation—Flaggy quartzite. Not rolled.

Primary flaking—Roughly oval in form. Some alternate flaking at one lateral margin and anterior portion.

Ku-C-1

In Silt



(19)

L 13·9 cm
B 10·1 "
T 4·5 "

MKB
18·7·40.

1 lb. 3½ ozs.

Ku-C-13

In Silt

(20)

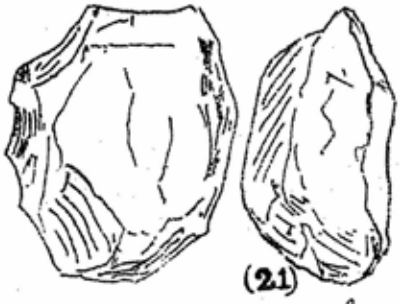
L 14·2 B 10·6 T 5·4

2 lbs. 7 ozs.

N.K.B.
14·1·40

Ku-C-42

In Silt



(21)

Doubtful.

lb. 2 7/16

9·8 cm.
8·3 "
5·5 "

MKB
21·5·41

1 lb. 1 oz.

Secondary flaking—None.

Type—Ovate biface of crude workmanship. (*G* II *e* i.)

(20) *Ku-C-13* : 14·2 cm. × 10·6 cm. × 5·7 cm. ; 2 lbs. $\frac{3}{4}$ oz. ; collected near the trench, not within it. 30 ft. 9 in. N. by 17° W. of N-E corner of trench. Depth 2 ft. $2\frac{1}{4}$ in.

Rock and Preservation—Quartzite, stained deep red, with ferruginous incrustation. Weathered, but not rolled.

Primary flaking—Large portion of dorsal face is original pebble surface. Ventral face of low convexity. Alternate flake-scars on convex left margin. Right margin is nearly straight when viewed laterally.

Secondary flaking—None.

Type—Thick discoidal tool on boulder. (*A* I.)

41. Tools from Second Trench, Quarry C, Kamata Village.

Twenty-three tools were recovered in course of this excavation. It is interesting that several tools in this trench were recovered from a common level and close to one another. This level lay between 2 ft. 2 in. and 2 ft. 8 in. below ground level, *i.e.*, near the end of the pisolitic laterite and a little above the upper margin of the boulder conglomerate. This trench was also dug in the form of a series of steps like Trench 1 in Tank A, Kuliana. The northern reference line B D ran W. to E. and was 6 ft. in length.

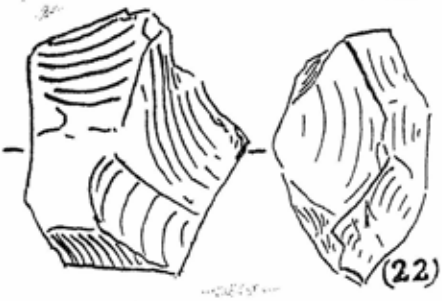
The following tools were recovered :—

(21) *Ku-C-42* : 9·8 cm. × 8·3 cm. × 5·5 cm. ; 1 lb. 1 oz. ; 3 ft. 2 in. E. of western datum line in this trench, 4 ft. 8 in. S. of northern reference line. Depth 3 ft. $\frac{1}{2}$ in.

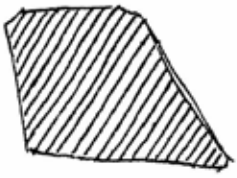
Rock and Preservation—Fine-grained quartzite, deep ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to thick discoid form with plano-convex section. Middle of right margin and posterior portion together form a sort of thick holder. Anterior portion and left margin together form convex working edge.

Ku-C-46 in situ



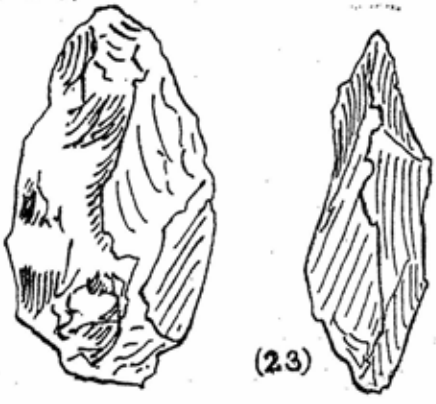
(22)



6020.
AMB
30.5.41

Doubtful
Pl. 27 1/2
6.4 cm
4.4 "
4.3 "

Ku-C-31 in situ

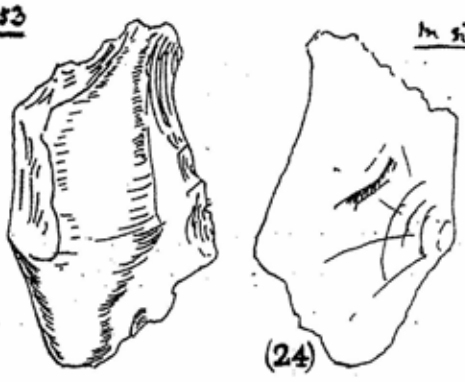


(23)

15.5 cm.
9.0 "
5.4 "

I Ll 6 3/4 025.

Ku-C-53 in situ



(24)

AMB
29.11.41

12020.

12.5 cm.
8.0 "
3.2 "

Secondary flaking—Some stepped fractures are present in the anterior portion, no marginal retouch.

Type—Thick side-chopper with upright holder and convex working edge opposite. (*B* II *a*.)

(22) *Ku-C-46* : 6·7 cm. × 4·4 cm. × 4·3 cm. ; 6 oz. ; 1ft. 6 in. E. of western extremity of northern reference line. Depth 2 ft. 9 in.

Rock and Preservation—Fine-grained quartzite, slight ferruginous incrustation. Not rolled.

Primary flaking—Small polyhedral form with one lateral margin upright, and a deeply convex sinuous working edge opposite.

Secondary flaking—None.

Type—Small side-chopper with upright holder and convex margin opposite. (*B* II *a*.)

(23) *Ku-C-31* : 15·5 cm. × 9·0 cm. × 5·4 cm. ; 1 lb. $6\frac{3}{4}$ oz. ; 6 ft. 6 in. S. of eastern extremity of northern line of reference. Depth 2 ft. 9 in.

Rock and Preservation—Compact quartzite, heavy ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to amygdaloidal form, except for a small flat patch of cortex on the right lateral portion of dorsal face. Lateral margins are slightly convex.

Secondary flaking—Some stepped flaking in the middle of the left margin and anterior portion of right margin; these may have been due to use.

Type—Amygdaloidal biface. (*G* II *c* ii.)

(24) *Ku-C-53* : 13·5 cm. × 8·0 cm. × 3·2 cm. ; 12 oz. ; 2 ft. 6 in. E. of N-S line. Depth 2 ft. 9 in.

Rock and Preservation—Fine-grained quartzite, heavy ferruginous incrustation. Not rolled.

Primary flaking—Large flake first knocked off from a boulder leaving a flat ventral face with bulb of percussion at one side. This makes an indeterminable angle (broken) with the unprepared striking platform. Dorsal face

Ku-C-43 In situ

(25)

12·0 cm
10·6 "
4·3 "

NMB
29·5·41

1 lb. 5 3/4 ozs.

Ku-C-40 In situ

(26)

Left Profile

Doubtful.
A. 27 1/2°

12·0 cm
9·6 "
5·3 "

NMB
30·5·41

1 lb. 3/4 ozs.

Ku-C-26 In situ

(27)

14·6 cm
7·8 "
4·8 "

NMB
29·5·41

1 lb. 2 1/4 ozs.

is convex with cortex running from anterior to posterior. Right margin and anterior to middle of left margin trimmed by one-sided strokes directed from ventral towards dorsal surface.

Secondary flaking—None.

Type—Possibly a knife. Pebble tool. (*D* I.)

(25) *Ku-C-43* : 12·0 cm. × 10·6 cm. × 4·3 cm.; 1 lb. 5¾ oz.; 5 ft. 6 in. E. of N-S line, due E. of point B. Depth 2 ft. 8 in.

Rock and Preservation—Flaggy quartzite, deeply encrusted with ferruginous matter. Not rolled.

Primary flaking—Trimmed to discoidal form. Both faces completely worked over, except for a small flat patch on the dorsal face which is due to fracture along joint plane. Flakings are numerous and short.

Secondary flaking—Small stepped flakings present along the margin.

Type—Large discoidal hand-axe. (*G* II *e* ii.)

(26) *Ku-C-40* : 12·0 cm. × 9·. cm. × 5·3 cm.; 1 lb. 0¾ oz.; 3 ft. 5 in. S. of BD, 2 ft. 4 in. E. of N-S line. Depth 2 ft. 8 in.

Rock and Preservation—Quartzite, stained deep red, no incrustation. Not rolled.

Primary flaking—Subtriangular form. The two lateral margins show irregular alternate flaking.

Secondary flaking—None.

Type—Possibly anterior portion of a hand-axe. (*G* III.)

(27) *Ku-C-26* : 14·6 cm. × 7·8 cm. × 4·8 cm.; 1 lb. 2¼ oz.; 7 ft. 6 in. S. of BD, 2 ft. E. of N-S line.

Rock and Preservation—Fine-grained flaggy variety of quartzite, deep ferruginous incrustation and stain. Not rolled.

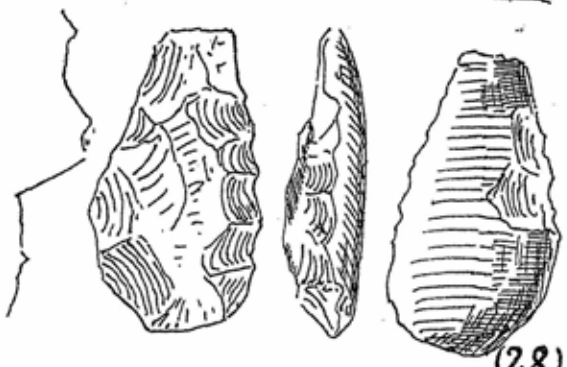
Primary flaking—Trimmed to oblong form with roughly plano-convex section. Lateral margins are slightly convex, asymmetrical.

Secondary flaking—None.

Type—Oblong biface. (*G* II *e* ii.)

Ku-C-27

In situ



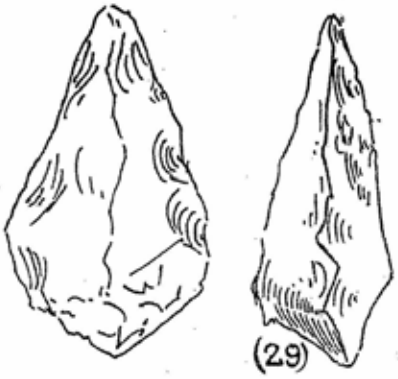
(28)

MKB
31.5.41 $7\frac{3}{4}$ oxs.

10·6 cm
6·6 "
3·3 "

Ku-C-24

In situ



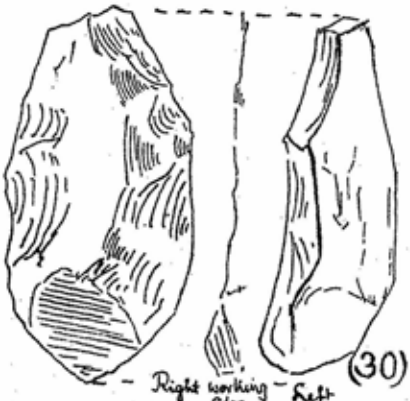
(29)

MKB
30.5.41 Lb. $2\frac{3}{4}$ oxs.

14·7 cm
9·2 "
4·5 "

Ku-C-37

In situ



(30)

Right working edge — Left profile

MKB
30.5.41 $10\frac{3}{4}$ oxs.

L 11·4 c
B 6·3
T 4·0

(28) *Ku-C-27* : 10·6 cm. × 6·6 cm. × 3·3 cm. ; 7¾ oz. ; 4 ft. 2 in. E. of N-S line, 3 ft. 4 in. N. of BD. Depth 2 ft. 4½ in.

Rock and Preservation—Fine-grained quartzite, moderate ferruginous stain and incrustation. Not rolled.

Primary flaking—A pebble was first split and then the split dorsal surface carefully dressed to produce a truncated amygdaloidal form. Almost all the strokes are from the ventral towards the dorsal face. Flake-scars are generally shallow, regularly disposed on one lateral margin, irregularly disposed on the other.

Secondary flaking—Slight secondary stepped flaking on the regularly trimmed right lateral margin.

Type—Pebble tool resembling amygdaloidal biface with truncate anterior end. (*G* I *a*.)

(29) *Ku-C-24* : 14·7 cm. × 9·2 cm. × 4·5 cm. ; 1 lb. 2¾ oz. ; 7ft. E. of N-S line , 8ft. 6 in. S. of E-W line. Depth 2 ft. 4½ in.

Rock and Preservation—Medium-grained quartzite, deep ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to amygdaloidal form. Butt thick with careless dressing. Dorsal face convex, ventral flattish; both with partial low midribs. Margins straight and tapering anteriorly. Margins with very low sinuosity, but with alternate flaking.

Secondary flaking—None.

Type—Amygdaloidal biface. (*G* II *c* ii.)

(30) *Ku-C-37* : 11·4 cm. × 6·3 cm. × 4·0 cm. ; 10¾ oz. ; exact position unrecorded. Depth 2 ft. 4 in.

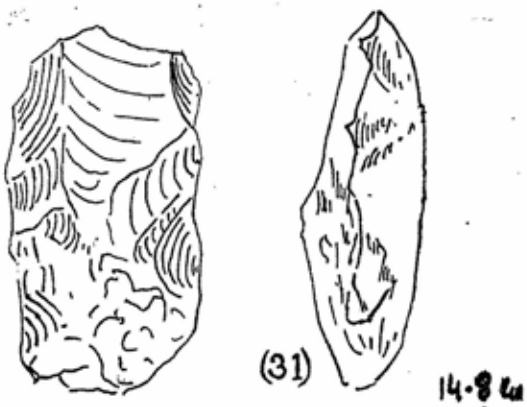
Rock and Preservation—Fine-grained quartzite with deep ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to oblong form. Flake-scars are shallow and extensive. Lateral margins slightly convex, left sharper than the right.

Secondary flaking—None.

Type—Crude oblong biface. (*G* II *e* i.)

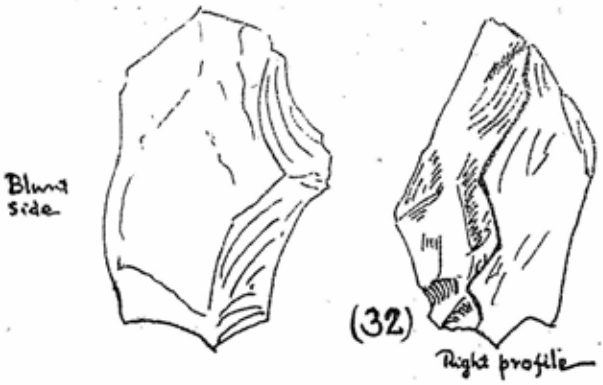
Ku-C-29 In situ



MLB
30.5.41 16.3 ozs.

14.8 cm
7.0
4.2

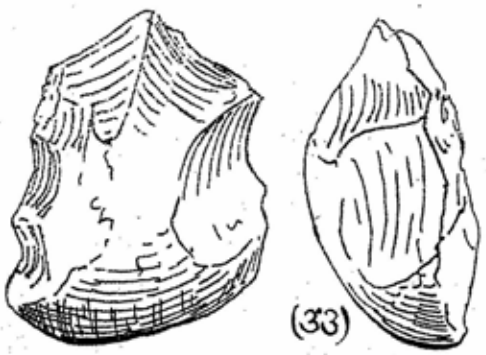
Ku-C-33 In situ



MLB
30.5.41 14 1/4 ozs

10.2 cm.
6.9 "
5.4 "

Ku-C-52 In situ



MLB
30.5.41 12 3/4 ozs.

9.8 cm
7.4 "
5.0 "

(31) *Ku-C-29* : 14·8 cm. × 7·0 cm. × 4·2 cm. ; 1 lb. 3 oz. ; 1 ft. N. of E-W line, 7 ft. E. of N-S line. Depth 2 ft. $3\frac{1}{2}$ in.

Rock and Preservation—Quartzite, which has weathered considerably. Deep ferruginous stain but no incrustation. Not rolled.

Primary flaking—Oblong form, trimmed on both faces. The sides are trimmed in such a manner as to produce a parallelogram-section for the tool. Anterior margin is irregular but sharp.

Secondary flaking—None.

Type—Oblong biface with /\-section, may be a cleaver. (*H* II *a*.)

(32) *Ku-C-33* : 10·2 cm. × 6·9 cm. × 5·4 cm. ; $14\frac{1}{4}$ oz. ; 6 ft. 10 in. S. of D. Depth 2 ft. 3 in.

Rock and Preservation—Fine-grained quartzite, deep ferruginous stain and slight incrustation. Not rolled.

Primary flaking—Dorsal face is mostly made up of original surface, only its right margin is trimmed sharp. Ventral face is largely one uneven flake-surface. Left margin is thick and upright, suitable as a holder ; right is deeply sinuous, and shows slight stepped fracture due to vertical blows on hard surface.

Secondary flaking—None, except for the slight scars produced by use, referred to above.

Type—Side-chopper with upright holder and jagged margin opposite. (*B* II *a*.)

(33) *Ku-C-52* : 9·8 cm. × 7·7 cm. × 5·0 cm. ; $12\frac{3}{4}$ oz. ; 1 ft. 6 in. E. of N-S line, 3 ft. S. of E-W line. Depth 2 ft. $2\frac{1}{2}$ in.

Rock and Preservation—Fine-grained quartzite with deep ferruginous incrustation. Not rolled.

Primary flaking—Tool has plano-convex section. Both the ventral and dorsal faces show pebble surface in the middle and posterior. On the dorsal face, a few shallow flake-scars slope away from the elevated

Ku-C-49

In situ

(34)

11·3 cm
4·1 "
4·1 "

MMD
29.5.41

11 ozs.

Ku-C-51

In situ

(35)

11·6 cm
8·6 "
5·0 "

1lb. 2¼ ozs.

MMD
29.5.41.

Ku-C-20

In situ

(36)

8·2 cm
7·0 "
3·7 "

7¾ ozs.

middle towards the right and anterior. Obtusely pointed anterior.

Secondary flaking—None.

Type—Chopper-like thick discoidal tool with pebble-butt and plano-convex section. (*A* II *a*.)

(34) *Ku-C-49* : 11·3 cm. × 7·1 cm. × 4·1 cm.; 11 oz.; 3 ft. 3 in. E. of N-S line, 5 ft. 3 in. N. of E-W line. Depth 2 ft. 2 in.

Rock and Preservation—Medium-grained quartzite, brown stain and moderate ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to oval form, both faces worked all over. Margins convex, strongly sinuous in one, less so in another. Both faces roughly convex.

Secondary flaking—A few stepped flakings present in the marginal portion.

Type—Oblong biface. (*G* II *e* i.)

(35) *Ku-C-51* : 11·6 cm. × 8·6 cm. × 5·0 cm.; 1 lb. 2¼ oz.; 3 ft. 6½ in. E. of N-S line, 4 ft. N. of E-W line. Depth 2 ft. 2 in.

Rock and Preservation—Fine-grained quartzite, deep ferruginous incrustation and stain. Not rolled.

Primary flaking—Trimmed to broad oval form; both faces worked, but the section is on the whole plano-convex. Posterior and right margins thick, suitable for holding tool. Opposite this portion is the sharp convex edge which extends from anterior to left.

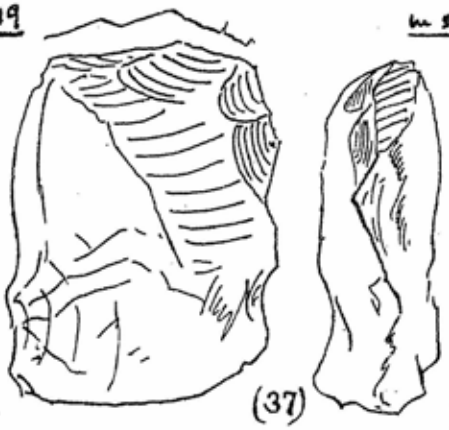
Secondary flaking—Slight stepped fractures at left margin, this may have been due to use or to retouch.

Type—Side-chopper with upright holder and convex jagged margin opposite, resembling ovate biface in form. (*B* II *a*.)

(36) *Ku-C-20* : 8·2 cm. × 7·0 cm. × 3·7 cm.; 7¾ oz.; 8 ft. E. of N-S line, 3 ft. 11 in. S. of E-W line. Depth 2 ft.

Rock and Preservation—Medium-grained quartzite, deep brown stain, no ferruginous incrustation. Not rolled.

Ku-C-19



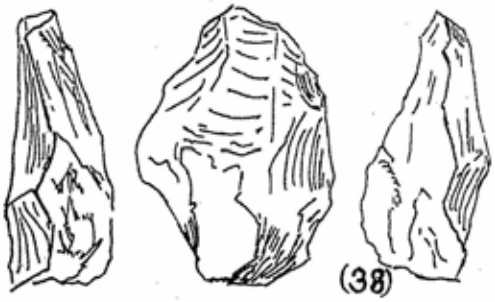
(37)

MKB
30.5.41

2 lbs. 7½ ozs.

14.4 cm
11.2 "
5.0 "

Ku-C-12



(38)

Doubtful
MB.
27.2.42

MKB
31.5.41

4½ ozs.

7.4 cm.
5.3 "
3.1 "

Ku-C-11

(39)

MKB
29.5.41.

14 ozs.

13.3 cm
7.9 "
4.1 "

Primary flaking—Trimmed to round form with an obtuse point in the anterior; more or less plano-convex in section. Original pebble surface present in the middle of dorsal face; shallow flake-scars slope down from it to the margin. Ventral face flattish. Left margin is more or less blunt, right sharp convex.

Secondary flaking—None.

Type—Discoidal tool with unequally sharp margins. May be round scraper. (*I*)

(37) *Ku-C-19*: 14·4 cm. × 11·2 cm. × 5·0 cm.; 2 lbs. 7½ oz.; exact location unrecorded. Depth 1 ft. 8½ in.

Rock and Preservation—Fine-grained quartzite with traces of ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to rectangular form, worked on both faces. Left margin and posterior are thick and show unworked surfaces. Right margin and anterior are comparatively sharp; the former shows some step-fractures.

Secondary flaking—None.

Type—Side-chopper resembling cleaver in appearance. (*B* II *a*.)

(38) *Ku-C-12*: 7·7 cm. × 5·3 cm. × 3·1 cm.; 4½ oz.; 1 ft. 11 in. E. of N-S line, 2 ft. S. of E-W line.

Rock and Preservation—Fine-grained quartzite, deep ferruginous stain and incrustation. Not rolled.

Primary flaking—Trimmed to oval form with thick posterior and thin anterior. Flake-scars shallow, irregular, alternate at margins, which are asymmetrical.

Secondary flaking—None.

Type—Small ovate tool. Possibly scraper. (*I* I *a*.)

(39) *Ku-C-11*: 13·3 cm. × 7·9 cm. × 4·1 cm.; 14 oz.; 1 ft. 10 in. E. of N-S line, 1 ft. 8 in. S. of E-W line. Depth 1 ft. 2 in.

Rock and Preservation—Medium-grained quartzite, stained greyish brown. Not rolled.

Primary flaking—Trimmed to almond shape. Faces worked all over, flake-scars not very clearly marked

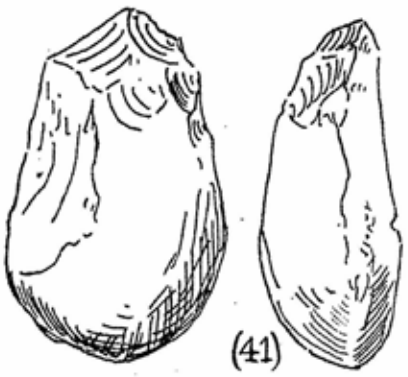
Kus-C-10 In Situ

(40)

MB
31.5.41 $14\frac{1}{4}$ oz. -

11·5 cm.
8·6 "
4·3 "

Kus-C-4 In Situ



(41)

MB
29.5.41. $12\frac{3}{4}$ oz.

11·4 cm.
7·2 "
4·4 "

Kus-C-30 In situ

(42)

MB
31.5.41. $6\frac{1}{2}$ oz.

9·6 cm.
6·8 "
3·9 "

off from one another; they are numerous and often small. Alternate flakings of low pitch all along margin.

Secondary flaking—More numerous along the right lateral margin than left. Some small stepped flakings are also present.

Type—Amygdaloidal biface. (*G* II *e* ii.)

(40) *Ku-C-10*: 11·5 cm. × 8·6 cm. × 4·3 cm.; 14¼ oz.; exact position unrecorded. Depth 1 ft. 1 in.

Rock and Preservation—Fine-grained quartzite, deep ferruginous stain but no incrustation. Not rolled.

Primary flaking—Trimmed to rectangular form with broad convex anterior. Middle of dorsal face unworked, ventral face wholly worked. Flake-surfaces shallow and irregularly disposed. Some stepped fractures are present near the lateral margins.

Secondary flaking—Convex anterior shows small stepped flaking more or less regularly disposed.

Type—Cleaver with convex anterior and squarish butt. (*H* II *e* ii.)

(41) *Ku-C-4*: 11·4 cm. × 7·2 cm. × 4·4 cm.; 12¾ oz.; exact position unrecorded. Depth 11½ in.

Rock and Preservation—Weathered quartzite, with brown stain and slight ferruginous incrustation. Not rolled.

Primary flaking—Pebble trimmed to oval form. Pebble butt and some portion of dorsal face unworked. Lateral margins show *symmetrically disposed stepped fractures*, which may have been due to strokes applied vertically upon one lateral margin while the other margin was resting on a hard surface (anvil). Anterior obtusely pointed.

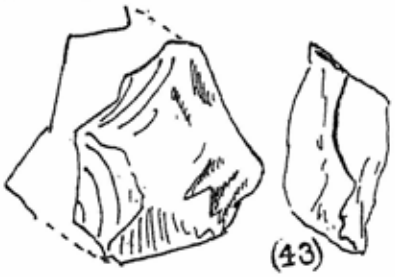
Secondary flaking—None.

Type—Biface with pebble butt, resembling oblong type. (*G* II *e* i.)

(42) *Ku-C-30*: 9·6 cm. × 5·5 cm. × 3·9 cm.; 6½ oz.; 2 ft. 3 in. E. of point B along line BD. Depth 9½ in.

Rock and Preservation—Flaggy variety of quartzite, deep ferruginous stain, slight incrustation. Not rolled.

Kan-C-9



(43)

5·2 cm
5·1 "
3·1 "

MMB
31.5.41

3 ozs.

KB-6B-2 (in situ)

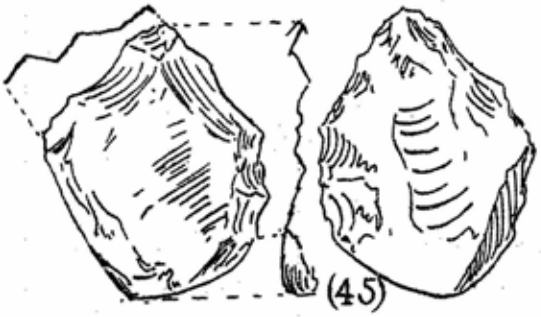
(44)

17·1 cm
10·4 "
5·7 "

weight. 31 ozs.

MMB
6.6.41

KB-6B-2 (in situ)



(45)

8·5 cm
7·0 "
2·8 "

weight. 7 ozs.

Primary flaking—Trimmed to oblong form. Dorsal face has an irregular eminence in the middle, ventral is nearly flat. Lateral margins convex.

Secondary flaking—Both free and step-flakings are present in the lateral margins.

Type—Small oblong biface. (*G* II e i.)

(43) *Ku-C-9*: 5·2 cm. × 5·1 cm. × 3·1 cm.; 3 oz.; exact location unrecorded. Depth 9 in.

Rock and Preservation—Fine-grained quartzite, no ferruginous incrustation.

Primary flaking—Trimmed to roughly pentagonal form. Flake-surfaces are comparatively deep and disposed alternately all round the margin.

Secondary flaking—None.

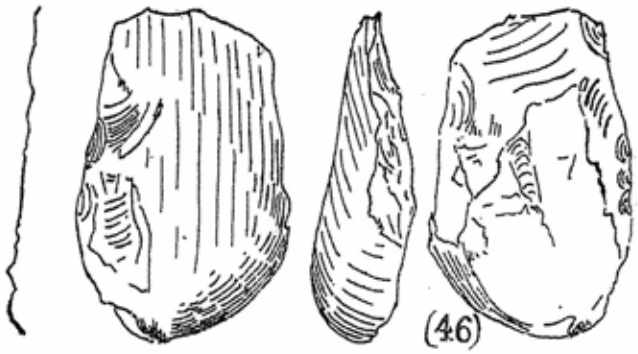
Type—Small thick tool resembling round scraper, but with deeply sinuous margin. (*I*)

42. The pits at Kalabaria

The village of Kalabaria is situated at a distance of 12 miles from Baripada on the Bangriposi Road. 139 yds. further ahead, a road from Sirsa meets the main road. The gravel quarries of Kalabaria are situated to the right or south of this road to Sirsa. Taking the junction as our point of reference, the pits of Kalabaria are situated thus:

No. of pit.	Distance from junction of Bangriposi Road along Sirsa Road.	Distance to south of Sirsa Road, at right angles to the measurement in previous column.
1	112 ft.	77 ft.
2	236 ft.	115 ft.
3	236 ft.	105 ft.
4	500 ft.	70 ft.
5	1016 ft.	70 ft.
6	878 ft.	157 ft.
6A	925 ft.	137 ft.
6B	1060 ft.	137 ft.
6C	1140 ft.	200 ft.
7	1207 ft.	153 ft.
8	1100 ft.	79 ft.
9	1298 ft.	247 ft.
10	1339 ft.	251 ft.

KB-6B-1 (in situ)



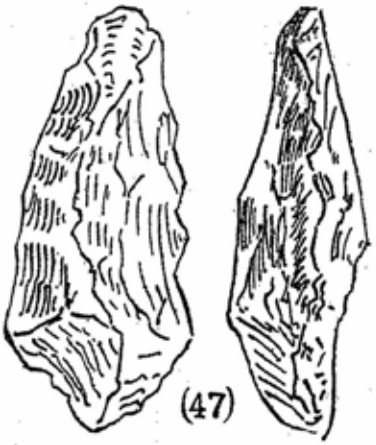
(46)

12·9 cm.
8·4 "
3·8 "

MB.
6.6.41

weight 15¾ ozs.

KB-VI/2-1 L In situ

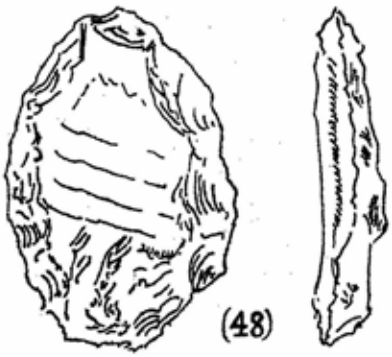


(47)

12·9 cm
5·6 "
4·0 "

9 ozs.

KB-7-2 (in situ)



(48)

7·8 cm
7·2 "
2·0 "

5¾ ozs.

MB
6·6·41

Besides these there are four more insignificant pits, Nos. 11, 12, 13, 14, farther away.

43. Tools found in situ at Kalabaria

(44) *Kb-6B-2*: 17·1 cm. × 10·4 cm. × 5·7 cm.; 1 lb. 15 oz.; western wall of pit 6B. Depth 2 ft. 7 in.

Rock and Preservation: Quartzite with numerous ferruginous patches. Not rolled.

Primary flaking—Trimmed to pear shape. Pebble butt, ventral face flattish, dorsal is also flattish; thick in the posterior, anterior thin and sharp.

Secondary flaking—Numerous stepped fractures along both margins near the anterior, some being large and some small.

Type—Peariform biface. (G II *b*.)

(45) *Kb-6B-3*: 8·5 cm. × 7·0 cm. × 2·8 cm.; 7 oz.; left wall of pit 6B. Depth 2 ft. 6 in.

Rock and Preservation—Quartzite, stained brown, slight ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to discoid form. Posterior and left lateral margin thick, anterior of same margin is trimmed. Right lateral margin convex and sinuous. Obtusely pointed anterior.

Secondary flaking—None on right margin, but the left margin shows a series of small stepped fractures which may have been due to vertical blows dealt with tool.

Type—Discoid tool which may have been used as chopper and side-scraper. (*A* II *b*.)

(46) *Kb-6B-1*: 12·9 cm. × 8·4 cm. × 3·8 cm.; 15¾ oz.; western wall of pit 6B. Depth 2 ft. 5 in.

Rock and Preservation—Fine-grained quartzite, stained brown, some ferruginous incrustation. Not rolled.

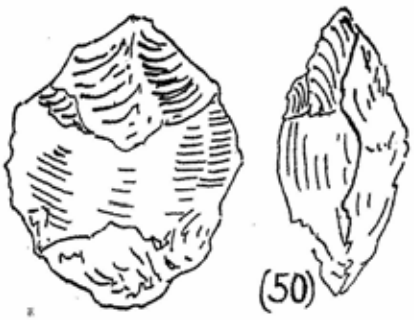
Primary flaking—Small boulder trimmed to nearly oblong form. Dorsal face is almost wholly pebble surface, with two stepped fractures near left lateral margin. Ventral face has an extensive flat flake-surface. Some

KB-M-1 (in situ)

10·0 cm.
6·4 "
4·2 "

$8\frac{3}{4}$ ors

KB-M-3 (in situ)

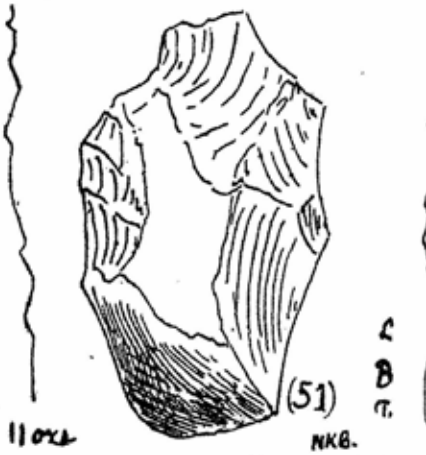


8·6 cm.
7·0 "
4·3 "

$8\frac{1}{4}$ ors.

NMB
6.6.41

KS-A-2



L 25·6 cm
B 15·8 "
T. 7·9 "

† 6½. 11 ors

NKB.
21.10.40

stepped fractures on this face are disposed at the lateral margins opposite to one another; this was probably due to working on an 'anvil' while the tool was resting on its side.

Secondary flaking—Slight at lateral margins, none in the anterior.

Type—Pebble tool resembling cleaver, but with working edge at the sides; may be a heavy knife. (*D*)

(47) *Kb-6C-1*: 12·9 cm. × 5·6 cm. × 4·0 cm.; 9 ozs. Collected in wall of Trench 6C.

Rock and Preservation—Quartzite with moderately heavy ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to narrow, thick, pointed form. Low ridge along middle of dorsal face, also on ventral face. Interflake margins are broken. Obtusely pointed butt. Sinuous lateral margins, straight when viewed from above.

Secondary flaking—Fairly numerous at margin.

Type—Poniard type of handaxe.

(48) *Kb-7-2*: 9·8 cm. × 7·2 cm. × 2·0 cm.; $5\frac{3}{4}$ oz.; pit 7, Depth 2 ft.

Rock and Preservation—Flaggy variety of quartzite, slight ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to thin oval form. Large portions of both faces are flat as a result of fracture along joint planes.

Secondary flaking—Margins trimmed all over, some of the flake-scars being of stepped character.

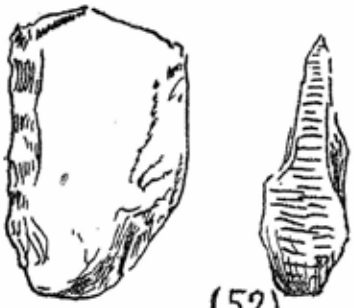
Type—Thin discoidal biface. (*G* II *e* ii.)

(49) *Kb-7-1*: 10·0 cm. × 6·4 cm. × 4·2 cm.; $8\frac{3}{4}$ oz.; pit 7. Depth 2 ft.

Rock and Preservation—Medium-grained quartzite, deep ferruginous incrustation. Not rolled.

Primary flaking—Trimmed on both faces. Lateral margins converge to a point in the anterior. Margins are alternately flaked. Posterior irregularly formed.

Ks-A-1



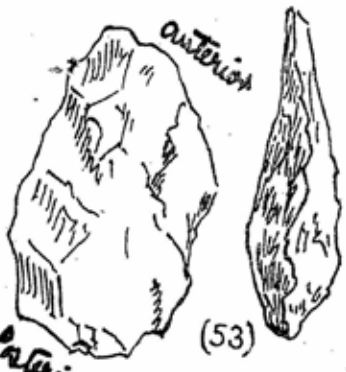
(52)

L. 12·6 cm. B. 6·7 T. 4·2 cm

14. 1½ 025.

M.K.B. M-1-400

NB 1 in Situ. L



(53)

8¼ 025.

11·4 cm.
6·8 ..
3·2 ..

NB 2 in Situ. L

(54)

5½ 025.

9·8 cm.
5·2 ..
2·9 ..

Secondary flaking—None.

Type—Apparently the anterior portion of a biface. (*G*)

(50) *Kb-7-3*: 8·6 cm. × 7·0 cm. × 4·3 cm.; 8¼ oz.; just above the compact laterite in pit 7 and at bottom of unconsolidated overburden. Depth 9 in.

Rock and Preservation—Medium-grained quartzite with heavy ferruginous incrustation. Not rolled.

Primary flaking—Pebble trimmed to thick discoid form. Original cortex present in the middle of dorsal face, margins trimmed sharp, anterior and posterior of left margin deeply sinuous, right less so.

Secondary flaking—None.

Type—Thick discoidal tool. (*A* I.)

44. Tools from Koilisuta

There are a few small gravel pits near a tank shown in the Survey Map near village Koilisuta. These yielded two tools embedded in the laterite.

(51) *Ks-A-2*: 25·6 cm. × 15·8 cm. × 7·9 cm.; 6 lbs. 11 oz.; From south face of small gravel pit, south of the tank referred to above. Depth 2 ft. 6 in.

Rock and Preservation—Fine-grained quartzite showing joint planes, slight ferruginous incrustation. Not rolled.

Primary flaking—One portion is smooth and rolled, so the original was a large, heavy boulder. Left margin is trimmed alternately, the flakings being very extensive. A portion of the right lateral margin is battered, this may have been due to trimming at the opposite edge while the block was resting on an 'anvil.'

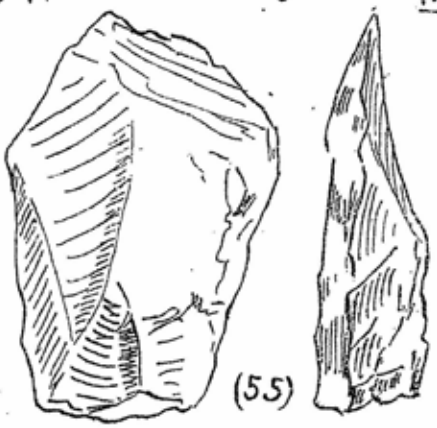
Secondary flaking—None.

Type—Very heavy knife of crude type. (*D* II *a*.)

(52) *Ks-A-1*: 12·6 cm. × 8·7 cm. × 4·2 cm.; 1 lb. 1½ oz.; small gravel pit lying S-E of the tank. Depth 1 ft. 5 in.

Rock and Preservation—Quartzite with slight ferruginous incrustation. Not rolled.

NB-74 In situ

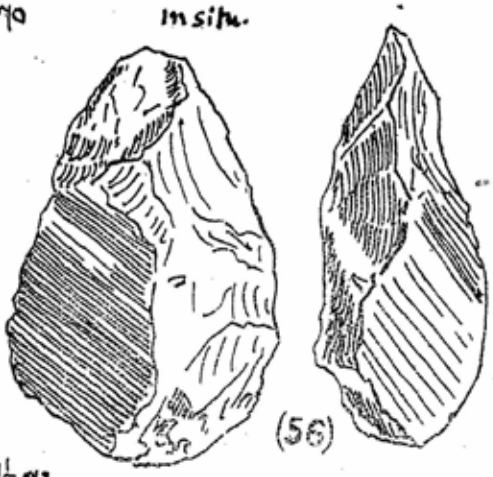


(55)

15·4 cm
11·0 "
4·6 "

14. 10½ ozs.

NB-90 In situ.



(56)

14·7 cm
11·8 "
7·3 "

3 lb. 1½ ozs.

AKL-1 Patina In situ.

(57)

L 15·6 cm
B 10·1 "
T 3·4 "

X 1lb 4¾ ozs.

Primary flaking—Dorsal and ventral faces intersect to form sharp transverse anterior margin. Right and left lateral margins are nearly upright. The left one has been trimmed so, while the right one shows original pebble surface disposed vertically. Butt is unworked.

Secondary flaking—None.

Type—Transverse cleaver with pebble butt. (*H* II *a*.)

45. Tools from Nuaberi

Four tools were recovered from the walls of the gravel pit at Nuaberi; they are described below:

(53) *Nb-1*: 11·4 cm. × 6·8 cm. × 3·2 cm.; 8¼ oz. Depth 1 ft. 11 in. from ground level.

Rock and Preservation—Vein quartz, no ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to roughly rectangular form with oblique anterior and U-shaped posterior. Both faces are trimmed all over. Right margin is thick while the left one is thin and sharp.

Secondary flaking—Small secondary retouches present along the left margin, some of them being stepped. Slight secondary retouch at the anterior margin.

Type—Guillotine type of cleaver with U-butt. (*H* II *b*.)

(54) *Nb-2*: 9·8 cm. × 5·2 cm. × 2·9 cm.; 5½ oz. Depth 1 ft. 5 in.

Rock and Preservation—Quartzite with slight ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to nearly oblong form. Lateral margins nearly parallel, anterior obtusely pointed. Many of the flakings are of stepped character, particularly along left margin.

Secondary flaking—Not much in evidence, except at the anterior end.

Type—Small biface with parallel sides, one of which is sharper than the other, and with obtusely pointed anterior. (*G* II *e* ii.)

(55) *Nb-74*: 15·4 cm. × 11·0 cm. × 4·6 cm.; 1 lb. 10½ oz.; from eastern wall of pit lying to the east of railway line, near telegraph post marked 42/12. Depth 1ft. 1in.

Rock and Preservation—Fine-grained quartzite, stained brown but no ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to long pentagonal form, thickest at butt, thin anterior. Oblique working edge in anterior has been formed by intersection of ventral surface and a short sloping surface on the dorsal side.

Secondary flaking—Both lateral margins show small step-fractures regularly disposed.

Type—Guillotine-like cleaver with divergent lateral margins and square butt.

(56) *Nb-70*: 17·7 cm. × 11·8 cm. × 7·3 cm.; 3 lbs. 1½ oz., found in principal pit. Depth 1ft. below ground level.

Rock and Preservation—Quartzite, stained red with moderate ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to thick pear shape. Posterior portion is worked little, anterior comparatively thin. Low midrib on dorsal face. Lateral margins are straight when viewed from above, sinuous when viewed in profile.

Secondary flaking—None.

Type—Thick, heavy peariform biface. (*G* II *b*.)

46. Tool from Pariakoli

(57) *Pkl-1*: 15·6 cm. × 10·1 cm. × 3·7 cm.; 1 lb. 4¾ oz.; found embedded in pisolitic laterite in a small pit behind the blacksmith's hut in Pariakoli village. Depth 2 ft. 6 in. below surface of ground.

Rock and Preservation—Coarse-grained quartzite with deep stain and slight ferruginous concretion. Anterior portion has weathered considerably. Not rolled.

Primary flaking—Trimmed to roughly triangular shape. Flake-scars shallow and extensive.

Secondary flaking—Irregularly disposed at the lateral margins.

Type—Thin large triangular biface; possibly was a transverse cleaver with pointed butt, of which the transverse edge has been injured by weathering. (*G* II *d*.)

47. Relative Age of different Types of Excavated Tools

We have already stated why it has not been possible to date the deposits of pisolitic laterite geologically. It is however possible to make certain general observations with regard to the relative antiquity of different types by a comparison of the tools recovered in course of the excavations.

(*a*) *Tank A, Kuliana*: The earliest tool was a small thick knife-like tool and a pebble trimmed into the form of an end-scraper. A side-chopper with convex working edge and a thick margin opposite, suitable as a holder, came next in the first trench.

In the second trench, the earliest tool was a large flake knife which was, first of all, detached from a boulder and then dressed marginally. Its platform is unprepared and inclines at an angle of 115° with the ventral face; so that the flake resembles Clactonian tools, but with the difference that its margin shows some neat retouch, some of which is alternate and laid close to one another. A finely finished amygdaloidal biface of vein-quartz came much later on, and was shortly followed by a rather irregular cleaver. A heavy side-chopper with a thick edge for holding followed next.

Two more tools discovered *in situ* in Tank A were a spindle-shaped biface and an irregular chopper on pebble; but they were found in isolation and so cannot be related to the two excavations.

(*b*) *Tank B, Kuliana*: The earliest tool was a biface with one convex and another straight lateral margin, which might have been used as a knife or a large side-scraper. This was followed by a pointed pebble tool, possibly a borer. A rostroid handaxe with truncate anterior (broken?) came later on,

but its workmanship is much cruder than that of the biface found deeper down. This was followed by two rather irregular bifaces.

(c) *Quarry C, Kamata*: This quarry yielded many artifacts, one of them having been obtained from the greatest depth among the whole series of excavations. This was a heavy split boulder having a straight chopping edge at one side, with the opposite margin thick and suitable for use as a holder. This was followed much higher up by a thick discoidal chopper. Then came a transverse cleaver on pebble and an ovate biface of crude workmanship. A thick discoidal tool on boulder was discovered nearby at a slightly greater depth than the uppermost tools in this trench.

The second trench in this quarry was comparatively rich in tools. The earliest one was a thick chopper with upright holder and a convex working edge opposite. Another smaller one of similar type came after this. This was followed by an amygdaloidal biface and an irregular flake-knife showing a large cortical surface on the dorsal face. The bulb on the ventral face is at one lateral margin and the unprepared striking platform makes an indeterminable angle (because broken) with the ventral. These few tools were followed by a layer much more prolific in tools, most of them being well-worked bifaces of various types—oblong, ovate, amygdaloidal. A transverse cleaver with a body having the section of a parallelogram followed; while choppers of cruder workmanship, with upright holder and convex sinuous margin opposite continued. This last type seems to have been influenced by the technique of manufacturing bifaces, for one chopper (no. 35, *Ku-C-51*) resembles an ovate biface in form. The trimming of discoidal tools also became neater. Cleavers of irregular, indifferent workmanship had already appeared, and near the upper end of the trench one has a convex margin and squarish butt. Crude choppers, but smaller in size than formerly, continued to exist.

Right near the top we come across a new technique which appears in a deeper layer in Kalabaria. These tools seem to have been dressed on one lateral margin by nearly vertical

blows while the block was resting on the other margin upon some hard object serving as an anvil. Under such blows, symmetrically disposed step-fractures developed on or near the margins, the fractures being generally deep and extensive.

(*d*) *Kalabaria*: The *in situ* tools from Kalabaria begin with a finely worked peariform biface. But cruder handaxes continued side by side, for they also appeared several inches higher. Cleaver-like tools, with working edge at the side, came in here, while discoid tools, used as chopper or side-scraper, continued to occur. The method of working on an anvil appeared here fairly early (no. 46, *Kb-6B-1*) but this does not seem to have been a very common process.

(*e*) *Koilisuta*: Yielded a very crude heavy boulder trimmed on one margin, this being followed by a neat transverse cleaver with pebble butt.

(*f*) *Nuaberi*: All the tools of Nuaberi are confined to a thin layer of secondary pisolitic laterite at the top of the mound. Here the earliest one was a small guillotine-type of cleaver with U-butt. Close by, lay a neatly worked biface with parallel sides and obtusely pointed anterior, possibly a knife. Then came another guillotine cleaver, with divergent lateral margins this time, and lastly a thick heavy peariform biface. This is interesting, as it shows that crude bifaces continued to be manufactured even after better techniques had been mastered.

(*g*) *Pariakoli*: Yielded only one thin biface, possibly a transverse cleaver with pointed butt.

48. General Observations

The following general observations can now be made:

(*i*) The earliest tools seem to have been choppers with straight or convex working edge (trimmed from one face or irregularly or alternately) at one side and a thick margin opposite, suitable for serving as holder. The chopping edge does not show any secondary retouch, but is often with step-fractures, which evidently resulted from heavy vertical blows dealt with the tool on some hard object.

(*ii*) This was followed by bifaces of irregular form and flake tools with unprepared striking platform forming an obtuse angle with the ventral face. Unlike Levalloisian flakes, these were first of all knocked off from the core and then dressed. One of the earliest, curiously enough, shows good marginal retouch, the strokes being frequently alternate.

(*iii*) After this came much more neatly worked bifaces of regular form and then a few, rather crude, cleavers. Only one cleaver (no. 31, *Ku-C-29*) of well-executed and regular form was found in course of the excavation. One interesting fact at this stage is that choppers of an earlier type continued to exist side by side with the more regular tools. But these choppers show a decided improvement in technique. They become smaller, often indistinguishable from side-scrapers, and also resemble some forms of bifaces. But even in such cases, step-fractures resulting from heavy vertical blows show how they had been used.

At this stage, another technique is first met with. Tools were dressed while they lay on one of their sides upon an anvil; but the method does not seem to have been generally employed. This process apparently began fairly early in Kalabaria, a little after fine peariform bifaces were being manufactured.

VI. CLASSIFICATION AND DESCRIPTION OF TOOLS

49. Principle of Classification

It is not possible, at this distance of time, to find out with any degree of assurance, how prehistoric man actually used the stone tools which we dig up today. We have largely to go by guess-work, and depend upon stray fractures in the tools themselves for some clue about their probable mode of use.

The principle followed in the present chapter is based largely upon the imagined function of the tools. These are A. Cutting or hacking by means of heavy blows, B. Scraping and C. Piercing. Many tools must have been used for cutting as well as for scraping. But, we believe, there would be no harm if we keep the

A. FOR CUTTING OR HACKING.

A — Chopper. Nearly O form with sharp margin, either wholly or nearly all round.
- *AI* — Pebble tool.
- *AIIa* — Core, heavy, round or square.
- *AIIb* — Core, smaller type, discoidal.

B — Side-chopper. Convex sharp lateral margin, opposite margin generally thick (holder) (Large edition of side-scraper).
- Pebble
  - *BIa* — Working edge jagged or alternately flaked.
  - *BIb* — Working edge produced by one-sided flaking.
- Core
  - *BIIa* — Jagged working edge or alternately flaked.
  - *BIIb* — Working edge produced by one-sided flaking.
- Flake
  - *BIII* — Natural or unifacetted striking platform, obtuse flaking angle.

C — Chopper (?). No holder opposite working edge. Irregular form.

D — Knife (Thick). Straight sharp lateral margins. Assymmetrically flaked. Margins are slightly convergent or parallel.
- Pebble
  - *DI* — Lateral margin slightly convergent anteriorly.
- Core
  - *DIIa* — Lateral margins roughly ‖, usually assymmetrically flaked.
  - *DIIb* — Nearly rectangular form, faces nearly flat.
- Flake
  - *DIIIa* — ‖ sides, irregular.
  - *DIIIb* — ‖ sides, regular, like cleaver, but thick anterior and posterior.

E — Rostro-carinate. Core.

F — Rostroid Handaxe. Core. Form like that of crude handaxe, but with steep △ or rhomboidal cross-section in the anterior.
- Pebble
  - *FIa* — Large portion of original cortex remaining over.
    - *FIa* — Handaxes other than ovate.
    - *FIb* — Ovate forms.
- Core
  - *FIIa* — Large, heavy, with broad anterior and pebble butt.
  - *FIIb* — Pear-form.
  - *FIIc* — Almond (Amygdaloidal) form.
    - *FIIci* — Crude workmanship.
    - *FIIcii* — Fine workmanship.
  - *FIId* — Triangular or Subtriangular.
  - *FIIe* — Ovate or oblong (Lateral margins show marked convexity).
    - *FIIei* — Crude workmanship.
    - *FIIeii* — Fine workmanship.
  - *FIII* — Irregular forms.
- Flake
  - *FIVa* — Almond shaped.
  - *FIVb* — Ovate form.

G — Handaxe. Tools with well-defined dorsal and ventral faces meeting at sides and anterior. Long antero-posteriorly.
- Pebble
  - *GIa* — With transverse straight margin.
    - *GIa* — Crude flaking and form.
    - *GIb* — Advanced flaking and form.
  - *GIb* — Transverse anterior.
- Core
  - *GIIa* — Guillotine type.
  - *GIIb* — Convex anterior.
    - *GIIci* — Regular form.
    - *GIIcii* — Irregular form.
- Flake
  - *GIIIa* — Transverse anterior.
  - *GIIIb* — Oblique anterior or Guillotine type.
  - *GIIIc* — Convex anterior.

H — Cleaver. Working edge transversely placed in the anterior. Lateral margins roughly parallel.

B. FOR SCRAPING
Convex or straight lateral margin generally small and light.
- Side-scraper
  - *IIa* — Core
  - *IIb* — Flake
- *III* — End-scraper Core

C. FOR PIERCING
Small pointed bifac possibly used as points.
- *JI* — Core
- *JII* — Flake

D. DOUBTFUL USE
- K — Knapped core.
- L — Small irregular core-tools.
- M — Flakes showing crude Levallois technique.
- N — Irregularly shaped flakes, probably waste-flakes.

heavier ones under A and smaller or more delicate ones under B. Some of the examples under C resemble pointed cutting tools, excepting for the fact that they are too small or delicately flaked to have been used for any heavy service.

A. Chopper: Nearly circular form, with sharp margin either wholly or nearly all around. 10·56% of total number.*

A-I—*Pebble tool.*

General characteristics—These tools are more or less circular and present a large pebble surface on one or both faces. The weight in Mayurbhanj varies from 2 lbs. 2½ ozs. to 9 ozs. and the length from 13·1 cm. to 8 cm. Form 7·1% of Family A.

Example (I), Nb-22: 8·0 cm. × 7·0 cm. × 4·1 cm.; 9 ozs.; collected within the gravel quarry at Nuaberi.

Rock and Preservation—Fine-grained quartzite, moderate ferruginous incrustation. Not rolled.

Primary flaking—Dorsal face is almost wholly formed by original rolled pebble surface, except for one shallow primary scar. Ventral face is flattish, with irregularly disposed scars. Margin is jagged.

Secondary flaking—Absent.

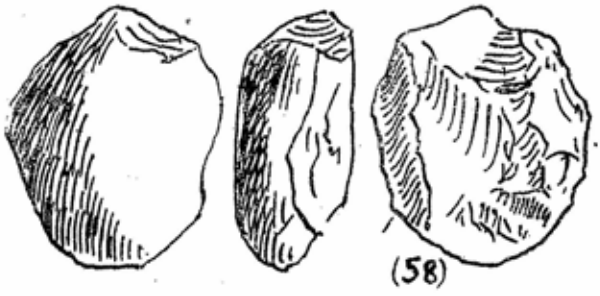
A-II-a—*Core tool, heavy roundish or squarish.*

General characteristics—These tools retain little of the original pebble surface, and are thus bifaces of a roundish form. Some are almost circular, while others are more nearly like a square or rectangle, of which the sides are, more or less convex. The members of type A-II-a are on the whole, heavy, the weight ranging from 4 lbs. 12 ozs. to 15½ ozs., the average

* The total number of tools recovered loose from pits or from the surface of the ground is 663. *In situ* tools have not been taken into account in the calculation of these percentages.

NB 22

Ⓛ AI



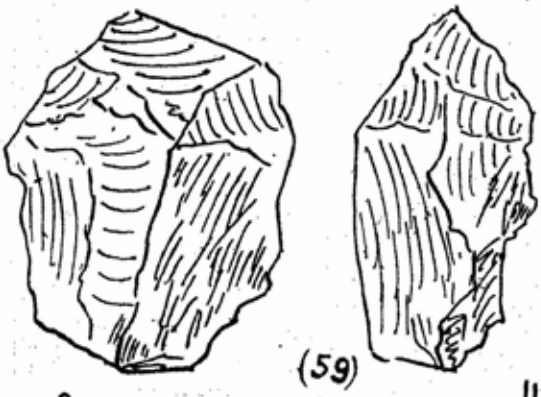
(58)

9 ozs.

8·0 cm.
7·0 "
4·1 "

MN-Sf-2

AII a



(59)

1 lb. $8\frac{3}{4}$ ozs.

11·4 cm.
9·7 "
6·0 "

Ku-sf-94

AII b

(60)

10 ozs.

L 8·8 B 7·8 T 3·5 cm.
MKB
10·7·60

being about 1 lb. 15 ozs. The length varies from 17·7 cm. to 9·8 cm. and the thickness from 8·8 cm. to 4·5 cm. Form 40% of Family A.

Example (2), Mn-Sf-2: 11·4 cm. × 9·7 cm. × 6·0 cm.; 1 lb. $8\frac{3}{4}$ ozs. Found on jungle path amidst irregularly broken rocks on the way to village Mundaboni, 4 miles west of Kuliana.

Rock and Preservation—Quartzite, without ferruginous incrustation, but light stain.

Primary flaking—Free flaking from anterior and two lateral margins have left short midribs on both faces, so that the middle and posterior has a rhomboidal cross-section. Butt is unworked and retains a portion of original cortex. Lateral margins show sinuosity.

Secondary flaking—Absent. But heavy blows dealt with tool have produced irregularly disposed step-fractures at margin.

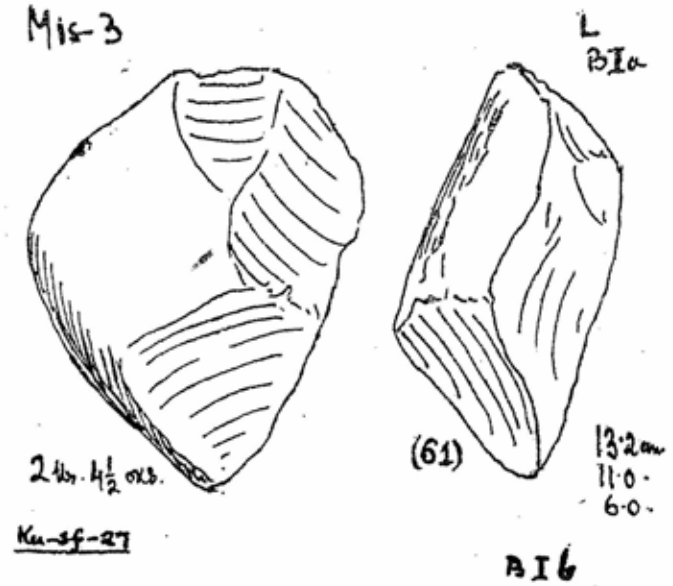
A-II-b—*Core tool, smaller type, discoidal form.*

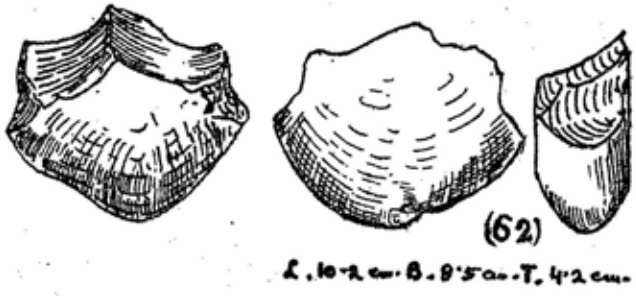
General characteristics—These hardly retain any portion of the original pebble surface, the flaking having been more extensive. On the whole, this type is thinner and smaller than type *A*-II-a. The form is more nearly discoidal. The weight ranges from 1 lb. $0\frac{3}{4}$ oz. to $3\frac{1}{4}$ oz. the average being about 11 ozs. The length varies from 12·5 cm. to 6·8 cm. and the thickness from 6·8 cm. to ·2·0 cm. Form 52·8% of Family A.

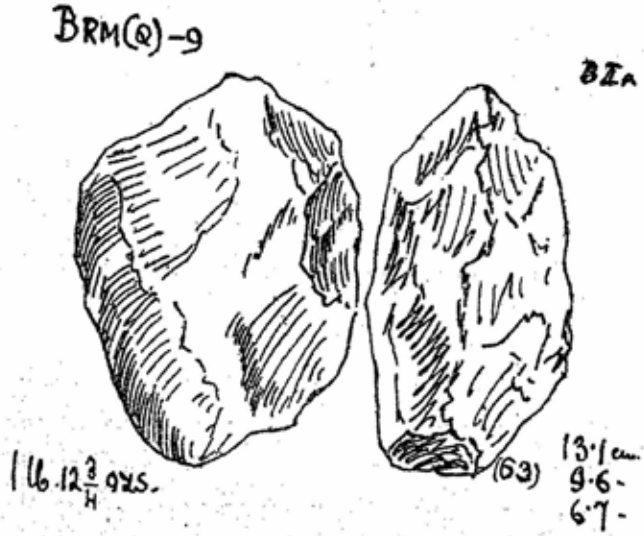
Example (3), Ku-Sf-94: 8·8 cm. × 7·8 cm. × 3·5 cm.; 10 ozs.; found near gravel pit beside the junction between Bangriposi and Sirsa Roads.

Rock and Preservation—Quartzite, stained brown, but with no ferruginous incrustation. Not rolled.

Primary flaking—Both faces are nearly flat, general form is almost circular. Posterior is thick, while rest of margin is thin and sharp, flakings being free and irregularly alternate; anterior obtusely pointed.


Mis-3
L
BIa
2 lbs. 4½ ozs.
(61)
13·2 cm
11·0 -
6·0 -
Ku-sf-27
BIb


(62)
L. 10·2 cm. B. 9·5 cm. T. 4·2 cm.
1 lb.
M.K.B.
1-1-40


BRM(Q)-9
BIa
1 lb. 12 3/4 ozs.
(63)
13·1 cm
9·6 -
6·7 -

Secondary flaking—Absent. But a few step-fractures at side show that vertical blows were received at the edge, this being probably due to use.

B. Side-chopper: With more or less convex margin to one side, the opposite lateral margin being generally thick. The latter may be naturally so, or may have been artificially produced to serve as holder. These may be called side-choppers. 13·72% of total number.

B-I-a—*Pebble tool, working edge jagged or alternately flaked.*

General characteristics—Pebble tools having a more or less convex working edge at one side only. The working edge may extend over a portion or the whole of one lateral margin, the opposite margin serving as holder. The edge is produced by strokes directed both from the dorsal and the ventral towards the opposite face; it is consequently jagged. The weight in Mayurbhanj varies from 3 lbs. 8 ozs. to $9\frac{3}{4}$ ozs. and the length from 19·0 cm. to 8·4 cm. Form 27·5% of Family B.

Example (4), Mis-3: 13·2 cm. × 11·0 cm. × 6·0 cm.; 2 lbs. $4\frac{1}{2}$ ozs. Locality unrecorded.

Rock and Preservation—Fine-grained quartzite with no ferruginous incrustation or stain. Not rolled.

Primary flaking—This medium-sized quadrilateral boulder has been trimmed at one margin only by a few alternate strokes to produce a slightly convex, extensive cutting edge. Opposite lies the thick pebble butt, suitable for holding the tool while in use.

Secondary flaking—Absent.

B-I-b—*Pebble tool, working edge produced by flaking from one side only.*

General characteristics—Pebble tools having an irregularly convex margin on one side, the opposite lateral margin serving as holder. These have a flat ventral surface, which may be natural, or, as in

a few cases, artificially produced. The blows which produced the working edge are one-sided, *i.e.*, directed from the flat ventral towards the dorsal face. The weight in the specimens under consideration varies from 2 lbs. 11½ ozs. to 12½ ozs. and the length from 14·4 cm. to 9·8 cm. Form 8·8% of Family B.

Example (5), Ku-Sf-27 : 10·2 cm. × 8·5 cm. × 4·2 cm.; 1 lb. Collected from the surface of the ground near inspection bunglow, Kuliana.

Rock and Preservation—Quartzite, greyish, no ferruginous incrustation, but slight stain. Not rolled.

Primary flaking—Roughly oval pebble with flat natural ventral surface. Four free strokes applied on this face and directed towards the dorsal face have produced irregularly convex working edge at one side. There are sharp points at the intersection of different flake-scars in the margin, these have been left unretouched; so, the likelihood is that the tool was not meant for a scraper.

Secondary flaking—Absent.

B-II-a—*Core tool. Of irregular form, one lateral margin jagged but the opposite edge is designed to serve as thick holder.*

General characteristics—The pebble surface is practically completely flaked off. The cutting edge may be of high or low convexity, and often shows irregularly placed step-fractures which might have resulted from heavy vertical blows dealt with tool on some hard object. Some of the larger ones in this series resemble ovate handaxes, but the fact that one margin is vertical, rendered it necessary to bring them under this head. The smaller ones in this series may have been used as scrapers, but the working edge is often so jagged that it is more likely that they were used otherwise. The weight varies from 2 lb. 8¾ oz. to 6¾ oz. and the length from 17·0 cm. to 7·5 cm. Form 37·3% of Family B.

Example (6), *Brm-9*: 13·1 cm. × 9·6 cm. × 6·7 cm.; 1 lb. 12¾ oz. Collected in gravel pit near Buramara railway station.

Rock and Preservation—Coarse-grained quartzite with deep ferruginous stain, but no incrustation. Not rolled.

Primary flaking—The original was not a rolled pebble, but a small irregular block of quartzite (vein?). The working edge is confined to one lateral margin and was produced by free alternate strokes. The opposite margin is unworked and serves as a good holder.

Secondary flaking—Absent. Several step-fractures near working edge were probably produced by heavy vertical blows dealt with the tool.

B-II-b—*Core tool. Working edge produced by one-sided flaking.*

General characteristics—This type does not materially differ from type B-I-b, except for the fact that the original pebble surface is here entirely worked away. Only two specimens were found, of which one is described below. Form 2·2 % of Family B.

Example (7), *Ku-C-78*: 10·5 cm. × 6·5 cm. × 3·2 cm. 9¼ oz. Collected in Quarry C within the limits of village Kamata.

Rock and Preservation—Highly sheared quartzite, weathers easily. Stained brown. Not rolled.

Primary flaking—Irregularly oval form. Both dorsal and ventral faces are flat and parallel to one another, this being the result of fracture along joint-planes. The right lateral margin has been trimmed by a few one-sided strokes to produce a working edge of low convexity.

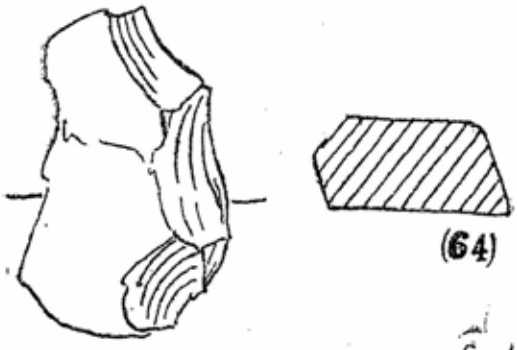
Secondary flaking—Absent.

B-III—*Flake tool.*

General characteristics—Many of these flakes are very thick and heavy. The striking platform is natural in some cases and unifacetted in others. In the latter examples,

Ku-C-78

BIIb



(64)

9/4 ozs.

L. 10.5
B. 6.5
T. 3.2

MKB
17.8.40

Ku.Sf-121

BIII

Side-scraper on flake

1 lb. 7 oz.

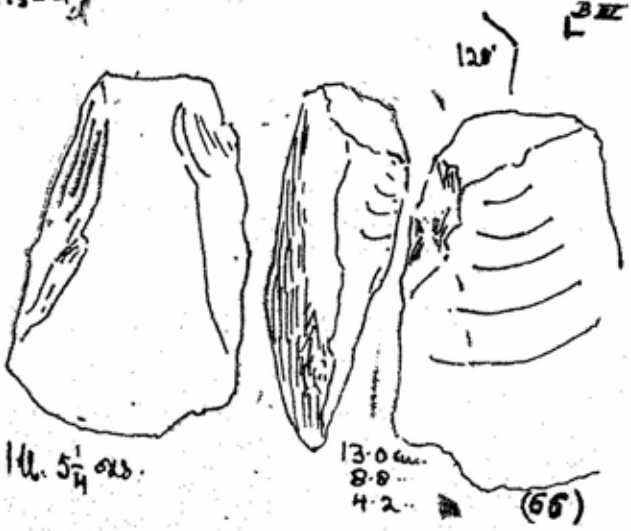
(65)

L 13.4 cm. B 8.9 cm T 5.1 cm

MKB
28.8.40.

Mis-4

BIII



1 lb. 5 1/4 ozs.

13.0 cm.
8.8
4.2

(66)

the ventral face makes an obtuse angle with the platform. The working edge is generally produced by one-sided strokes directed from the ventral towards the dorsal face. There may be a little secondary trimming, but this is rare. The thick edge opposite the lateral margin for working may be naturally so, or may have been artificially produced as in *Example* (*4*). The angle between the striking platform and ventral face is 112° in one case and 128° in another. The weight varies from 2 lbs. 3½ oz. to 10½ oz. and the length from 14·5 cm. to 9·2 cm. Form 12·2 % of Family B.

Example (*8*), *Ku-Sf-121:* 13·4 cm. × 8·9 cm. × 5·1 cm.; 1 lb. 7 oz. Collected in a small gravel quarry near inspection bunglow, Kuliana.

Rock and Preservation—Quartzite, with slight ferruginous incrustation on both dorsal and ventral faces. Not rolled.

Primary flaking—Large thick flake which was first knocked off from the parent boulder and then dressed. Unprepared striking platform makes ∠ 112° with ventral face, which has a moderately prominent bulb of percussion. The strokes intended to produce working edge were directed from the ventral towards the dorsal face. The margin opposite the working edge is naturally thick and retains the original cortex all over.

Secondary flaking—A few free and also resolved flake-scars are present at the working edge.

Example (*9*), *Mis. 4:* 13·0 cm. × 8·8 cm. × 4·2 cm.; 1 lb. 5¼ oz. Locality unrecorded.

Rock and Preservation—Fine-grained quartzite without ferruginous incrustation. Not rolled.

Primary flaking—A unifacetted platform was first produced on a boulder, and the large flake then knocked off. The flaking angle is ∠ 128°, the bulb of percussion being comparatively diffuse. One lateral margin is wall-like and may have been produced on the core before detachment. The other margin is sharp. The

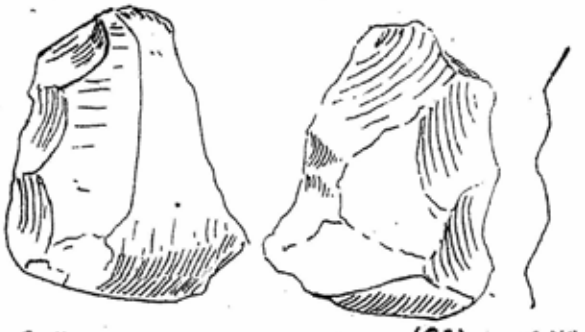
NB 61

L C

1 lb 6¾ ozs (67) 12·6 cm
8·7 "
5·0

Kha-sf-1.

D I



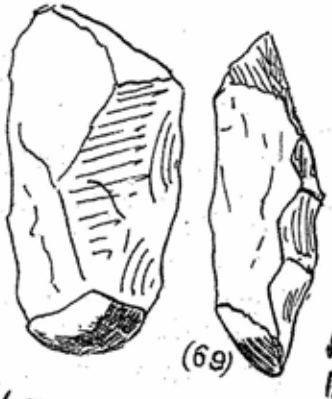
L 14·2 cm. B. 12·2 T. 4·1 cm. (68) NB 3/11

2 lbs. 5½ oz.

M.K.B.
31-12-29

Kha-sf-129

D II a



(69)

1 lb. 6½ oz.

L. 15·3 cm
B. 8·2 "
T. 5·1 " MKB 22/7/40

wall-like holder is artificial and not natural as in *Example* (*8*).

Secondary flaking—The working edge shows a few step-fractures, which may have produced the sharp edge itself, or been the result of use.

C. *Core tool. Rather irregular form, no suitable holder opposite working edge.*

General characteristics—These are core-tools, some resembling ovate handaxes in form, others resembling scrapers. The working edge is, in all cases, convex and limited to one lateral margin. The opposite margin may be unworked or blunt, but does not afford a suitable hold as in the case of B-II-a or B-II-b. It is not unlikely that a few examples of this type may be crude ovate handaxes or scrapers rejected in course of manufacture. The weight varies from 1 lb. 13 oz. to $7\frac{3}{4}$ oz. and the length from 13·1 cm. to 8·8 cm. Form 12.2 % of Family B.

Example (*10*), *Nb-61 :* 12·6 cm. × 8·7 cm. × 5·0 cm. ; 1 lb. $6\frac{3}{4}$ oz. Collected in the gravel quarry at Nuaberi.

Rock and Preservation—Medium-grained quartzite with moderate ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to rough ovate form, anterior and posterior ends have been left thick, the latter being unworked. Right margin is slightly and left markedly convex when viewed dorso-ventrally, and sinuous when viewed laterally.

Secondary flaking—Absent.

D. Knife. In both side-choppers and knives, the working edge is confined to the lateral margin. In side-choppers, it is more or less convex, while the opposite lateral margin is usually thick and serves as a suitable holder. In a knife, the holder is absent and the working edge nearly straight when viewed from above. Moreover, both lateral margins are sharp, which is not the case in side-choppers. These margins may, however,

be flaked asymmetrically. In knives, the lateral margins are often roughly parallel, and in one class, the tool assumes almost the form of a rectangle. The function of the knife and the side-chopper may have been in many respects similar; but there is a large amount of morphological difference between them. 6·03% of total number.

D-I—*Pebble tool. Lateral margins asymmetrically worked; they converge slightly towards the anterior.*

General characteristics—The anterior and posterior of these pebble tools do not receive any special treatment, the lateral margins alone are flaked with a plan. The flaking is often asymmetrical, one edge being jagged and the other straight when the tool is viewed in profile. The lateral margins converge anteriorly though they do not meet at a well-defined point. This gives this class of tools the appearance of very crude handaxes. The weight varies from 2 lb. 5¼ oz. to 9¾ oz. and the length from 14·2 cm. to 10·6 cm. Form 18·2 % of Family D.

Example (11), Ku-Sf-1: 14·2 cm. × 12·2 cm. × 7·1 cm.; 2 lb. 5¼ oz. Found on the surface of the ground near the inspection bunglow, Kuliana.

Rock and Preservation—Quartzite, stained dark brown, but no ferruginous incrustation. Not rolled.

Primary flaking—Subtriangular form. Cortex of original boulder extends from anterior tip across right half of dorsal face to all over butt. Left margin is jagged, while right is straight.

Secondary flaking—Absent. Some stepped fractures present along jagged margin, which may be due to use.

D-II-a—*Core tool. Lateral margins generally worked asymmetrically. They do not converge as in type D-I, but run roughly parallel.*

General characteristics—There is a butt end in several examples of this type, while others do not have it. The

lateral margins are roughly parallel. The dorsal and ventral faces are not flat or parallel to one another, being usually convex. This type has thus several points of resemblance with handaxes. The weight varies from 1 lb. 7½ oz. to 2 oz. and the length from 15·3 cm. to 6·3 cm. Form 50·0 % of Family D.

Example (12), Ku-Sf-129: 15·3 cm. × 8·2 cm. × 5·1 cm.; 1 lb. 6½ oz. Found amidst weathered blocks of diorite near culvert at mile 44/14 on the railway line near Kuliana.

Rock and Preservation—Quartzite with moderate ferruginous incrustation. Not rolled.

Primary flaking—A small portion of smooth cortex is present at the butt end of the tool. Form is roughly rectangular, both anterior and posterior ends being thick. Lateral margins are both jagged, but the strokes are not regularly alternate. Flakings are free and there are low midribs on both dorsal and ventral faces.

Secondary flaking—Absent. A few step-fractures occur at both margins near the butt end; they may be due to use.

D-II-b—*Core tool. Form is, on the whole, rectangular, the dorsal and ventral faces also being nearly flat.*

General characteristics—In form these resemble cleavers; but the chief distinction lies in the fact that the anterior and posterior ends are often thick, the lateral margins alone being flaked to sharpness. The weight varies from 1 lb. 5¾ oz. to 12¾ oz. and the length from 17·5 cm. to 11·0 cm. Form 13·6% of Family D.

Example (13), Ks-Sf-15: 13·1 cm. × 9·2 cm. × 4·1 cm.; 1 lb. 4 oz. Collected on the edge of a nullah near 44/2 milepost on the railway line in Koilisuta.

Rock and Preservation—Fine-grained quartzite; grey; with no ferruginous stain or incrustation. Not rolled.

Primary flaking—A slight patch of original cortex has been left over in the butt, from which it is apparent that the original was not a river-worn boulder. Trimmed

Ku-sf-15

DIb

(70)

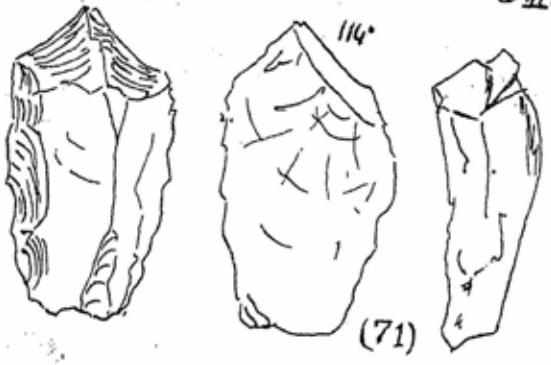
L 13·1 B 9·2 T 4·1

Lb. 4 oz.

MKB
29·5·40

Ku-sf-35

DIIIa



(71)

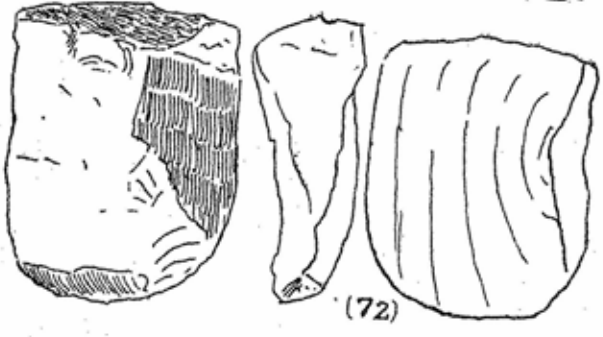
Lb. 3oz.

L. 13·9 cm B. 8·2 cm T. 5·1 cm.

M.K.B.
2·1·40.

Ku-A-10B

DIIIb



(72)

L. 11·3 cm.
B. 9·5 "
T. 4·7 "

× Lb. 3¼ oz.

MKB
4-8-40

to rectangular form, anterior thick and convex, posterior thick but irregular in outline. Flake-surfaces are extensive, shallow and of free nature.

Secondary flaking—Slight, irregular secondary flakings at lateral margins; some of these are stepped.

D-III-a—*Flake tool. Flakes with irregularly parallel sides, which are sharp.*

General characteristics—Irregularly shaped flakes, generally of oval form, with sharp lateral margins which may show secondary working. The striking platform is natural or unifacetted, the flaking angle being always obtuse. Most of these tools are fairly heavy. The weight varies from 1 lb. 3 oz. to $4\frac{3}{4}$ oz. and the length from 14·2 cm. to 8·1 cm. Form 15·9 % of Family D.

Example (14), Ku-Sf-35: 13·9 cm. × 8·2 cm. × 5·1 cm.; 1 lb. 3 oz. Collected in the jungle near Kuliana, 70 yds. north of $10\frac{1}{2}$ milepost on Sirsa Road.

Rock and Preservation—Quartzite, with moderate ferruginous incrustation. Not rolled.

Primary flaking—A few long parallel flake-surfaces were evidently produced on the dorsal face while the flake was still on the parent core. A unifacetted striking platform was then prepared and the flake knocked off, the flaking angle being c. 114°.

Secondary flaking—A few free flake-scars confined to one lateral margin are of this nature. They were produced by blows delivered only on the flat ventral face.

D-III-b—*Flake tool. Resembles cleaver in form but has a thick anterior and posterior.*

General characteristics—Only one example was found which is described below. Form 2·3 % of Family D.

Example (15), Ku-A-108: 11·3 cm. × 9·5 cm. × 4·7 cm.; 1 lb. $3\frac{1}{4}$ oz.

Rock and Preservation—Quartzite, grey, with ferruginous patches. Not rolled.

Ku-Sf-56

E

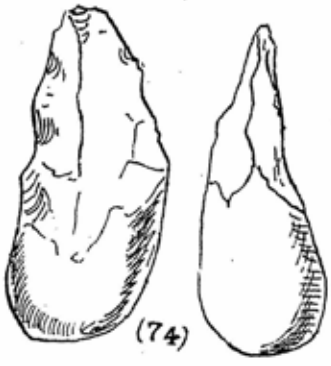
L. 13·5 cm B. 8·9 cm T. 4·5

1 Lb 5½ ozs.

N.K.B.
3-1-40

Ku-B-14

F



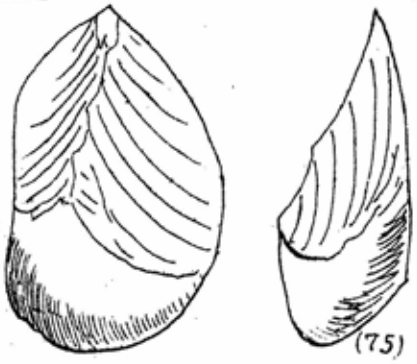
L 13·3 cm.
B 6·4 cm.
T 5·3 cm.

1 Lb.

MB
26-7-40

Ku-C-80

G-Ia



L 13·2 cm.
B 9·0 "
T. 5·4 "

X. 1 Lb 8 ozs.

MB
23-10-40.

Primary flaking—Rectangular form. Dorsal face has a raised portion towards the posterior. Ventral face is one flake-surface, convex antero-posteriorly. The left margin is wall-like, anterior is of the same nature. Right margin is sharp, but with no secondary working. It is formed by the intersection of ventral face and a sloping original pebble surface on the dorsal face. The ventral face has strong bulb of percussion near one of the lateral margins.

Secondary flaking—Absent.

E. Rostrocarinate.

General characteristics—These tools have a flat ventral and convex dorsal surface. On the dorsal face, there is a midrib which ends in a point in the anterior. In outward form, the tools are broad oval. Two examples were found with weights 1 lb. 5½ oz. and 7¼ oz.; the lengths being 13·5 cm. and 9·7 cm. respectively. 0·30% of total number.

Example (16), Ku-Sf-56: 13·5 cm. × 8·9 cm. × 4·5 cm.; 1 lb. 5½ oz. Collected from surface of ground inside jungle, nearly 200 yds. west of inspection bunglow, Kuliana.

Rock and Preservation—Quartzite, brown stain which is light or dark in patches, no ferruginous incrustation. Not rolled.

Primary flaking—Slightly concave ventral face and highly convex dorsal face, which has a flat patch in the middle, but from which a midrib starts in the anterior and ends in a point. In the posterior portion of the dorsal face again, there is a short rib. Unworked cortex extends from left half of posterior to middle of dorsal face. Flake-surfaces are shallow, confined to neighbourhood of margins, the blows being one-sided. Lateral margins convex when viewed from above, and straight when viewed laterally.

Secondary flaking—A few short step-fractures confined to anterior half of right margin. A few flake-scars are

also present in the middle of left margin, but these appear to be recent.

F. Rostroid handaxe.

General characteristics—These have one special feature which marks them off from other handaxes; they have a high triangular or rhomboidal cross-section, which results from the presence of well-defined and high midribs on their faces. The carina is not present and the butt end is unworked, as a rule. The weight varies from 2 lb. 1½ oz. to 11 oz. and the length from 18·5 cm. to 10·7 cm. 5.24% of total number.

Example (17), Ku-B-14: 13·3 cm. × 6·4 cm. × 5·3 cm.; 1 lb. Collected on the bank of Tank B at the market place, Kuliana.

Rock and Preservation—Quartzite, stained brown, no ferruginous incrustation. Not rolled.

Primary flaking—Long tool with pebble butt, midrib extends from almost anterior extremity to the butt. Left side of midrib on the dorsal face seems to be partly unworked. Ventral face is trimmed flat and is without midrib. Anterior is obtuse. Both lateral margins are trimmed in the anterior portion. Cross-section is acutely triangular.

Secondary flaking—A few small fractures at the right lateral margin and anterior may be of this nature. They are irregularly placed and the blows producing them were of unequal strength; so they may as well have been accidental.

G. Handaxe. Tools with well-defined dorsal and ventral faces, both of which meet at the sides and the anterior. The lateral margins converge anteriorly and are trimmed to form the working edges. The tools are long antero-posteriorly. 44·34% of total number.

G-I-a—*Pebble tool. Having a rough likeness to handaxes of other than ovate type.*

General characteristics—Form does not conform to any standard type but there is a rough resemblance to

handaxes. The weight varies from 5 lb. 6½ oz. to 9¾ oz and the length from 20·0 cm. to 8·5 cm. Form 7·1% of Family G.

Example (18), Ku-C-80: 13·2 cm. × 9·0 cm. × 5·4 cm.; 1 lb. 8 oz. Collected in Quarry C within village Kamata.

Rock and Preservation—Quartzite, with heavy ferruginous incrustation. Not rolled.

Primary flaking—An oval pebble has been trimmed in the anterior portion by two strokes which have knocked off two shallow, extensive flakes at the two lateral margins. Their intersection with each other and with the ventral pebble surface has produced a low midrib and an obtuse, but sharp tip.

Secondary flaking—Absent.

G-I-b—*Pebble tool. Roughly oval in form.*

General characteristics—One face of these tools is generally formed by the original surface of the pebble, the other being trimmed, more or less, completely. The weight varies from 1 lb. 12½ oz. to 13½ oz. and the length from 15·2 cm. to 11·2 cm. Form 1·4 % of Family G.

Example (19), Ku-E-2: 11·2 cm. × 7·8 cm. × 4·2 cm.; 13½ oz. Collected in gravel quarry near junction of Bangriposi and Sirsa Roads, Kuliana.

Rock and Preservation—Quartzite, stained brown but with no ferruginous incrustation. Not rolled.

Primary flaking—One face is entirely a convex pebble surface. The other is slightly convex, flaked all over. The flaking is of one-sided type.

Secondary flaking—Absent.

G-II-a—*Core tool. Large heavy handaxe with pebble butt and broad anterior.*

General characteristics—These tools retain their pebble butt and also a fairly large part of the original cortex on the dorsal face. There is no midrib. Although the lateral margins converge, yet they do not meet at a point, the anterior being broad and sharp. The

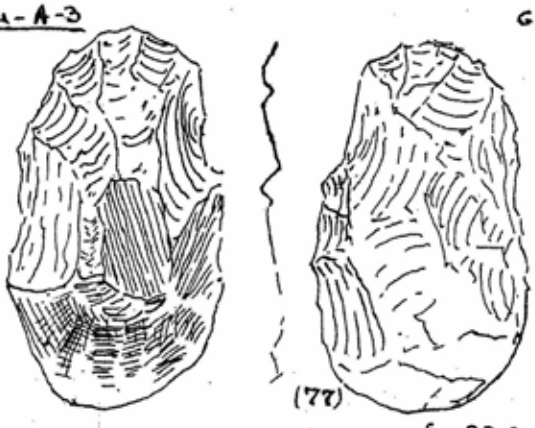
Ku-E-2 GI 6

(76)

L. 11·2 cm
B. 7·9 "
T. 4·2 "

MKB.
18.7.40. 13½ ozs.

Ku-A-3 GII a



(77)

L 22·8 cm.
B 11·9 "
T 6·9 "

4 lbs. 8 ozs.

MKB
1.8.40.

KB-8 GII b

(78)

15·1 cm
9·5 "
5·3 "

1 lb. 9½ ozs.

margins are asymmetrically flaked and jagged. The weight varies from 4 lbs. 8 oz. to 1 lb. 1¼ oz., the average being about 2 lb. 10 oz. The length varies from 23·8 cm. to 14·2 cm. Form 5·4 % of Family G.

Example (*20*), *Ku-A-3* : 22·0 cm. × 11·9 cm. × 6·9 cm. ; 4 lb. 8 oz. Collected within Tank A, Kuliana.

Rock and Preservation—Quartzite with slight ferruginous incrustation. Not rolled.

Primary flaking—Large boulder of which the original cortex is preserved at the butt end. The ventral face has been trimmed flat, while the dorsal is convex. Flake-scars are shallow and extensive, except at the anterior, where they are shallow and small. There is a deep broken depression near the butt on the dorsal face. The anterior is broad and convex.

Secondary flaking—Confined to the anterior edge; mostly of free type, only a few scars being stepped.

G-II-b—*Core tool. Peariform in appearance.*

General characteristics—Pear-shaped in outline, generally with unworked pebble butt. Thickest either in the middle or a little lower down. There may be a mid-rib; the anterior is, more or less, pointed. Lateral margins are jagged, but when viewed from above appear straight, the butt being of a round outline. The weight varies from 2 lb. 6¼ oz. to 9½ oz. and the length from 17·6 cm. to 11·1 cm. Form 5·1% of Family G.

Example (*21*), *Kb-8* : 15·1 cm. × 9·5 cm. × 6·3 cm. ; 1 lb. 9½ oz. Collected in an unspecified pit at Kalabaria.

Rock and Preservation—Quartzite, stained brown and with slight ferruginous incrustation. Not rolled.

Primary flaking—Dorsal face has pebble surface in the posterior portion. Low midrib from middle to anterior, from which flat flake-scars slope down laterally. The ventral face is very irregularly flaked. Margins converge anteriorly to meet at a blunt point. When viewed from the side, the margins show slight sinuosity.

BSN-sf-2

G-II-c(i)

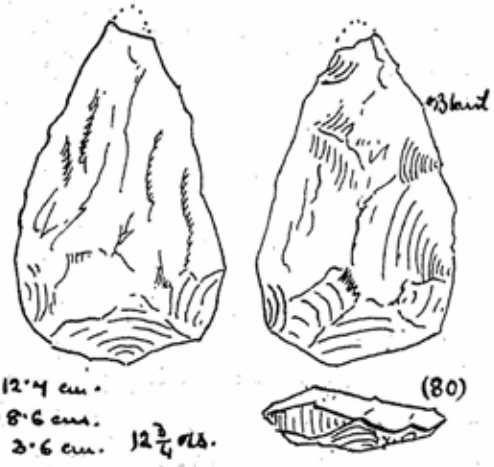
(79)

19·4 cm.
11·8 "
5·9 "

3 lbs-1 oz.

Km-sf-19

G II c(ii)



Blunt

(80)

L. 12·4 cm.
B. 8·6 cm.
T. 3·6 cm. 12 3/4 ozs.

Right

N.K.B.. 1.1.40

NB-72

L
G II d

(81)

19·4 cm
10·4 "
6·0 "

2 lb 3/4 ozs

Secondary flaking—A few small flake-scars are present at the anterior portion of the lateral margins; these may be intentional and of a secondary character.

G-II-c-i—*Core tool. Almond shaped, crude workmanship.*

General characteristics—The form is like that of an almond, some examples being comparatively long and some broad. The lateral margins are straight when viewed from above; and converge anteriorly to meet at a, more or less, acute point. The butt may be worked or unworked; in either case, it is round. When viewed in profile the lateral margins appear jagged. In a number of cases, there is a midrib on the dorsal face, many are without it. This type is comparatively thick; the greatest thickness being a little above the butt. The weight varies from 3 lb. 1 oz. to 6¼ oz., and the length from 19·4 cm. to 9·1 cm. Form 9·9% of Family G.

Example (22) Bsn-Sf-2: 19·4 cm. × 11·8 cm. × 5·9 cm.; 3 lb. 1 oz. Collected in a small nullah, south-west of tank near market place at Bhuasuni.

Rock and Preservation—Quartzite, schistose, without ferruginous incrustation. Not rolled.

Primary flaking—Large amygdaloidal form with thick butt, which is unworked on the dorsal face. Original crust of rolled boulder extends on this face from butt to near anterior end. Ventral face is concave antero-posteriorly. Lateral margins are straight when viewed from above. They converge anteriorly and end in a somewhat round anterior extremity. Primary flake-surfaces are either extensive or medium, the fractures being irregular owing to schistosity of the rock.

Secondary flaking—A few small marginal trimmings are present near the anterior end.

G-II-c-ii—*Core tool. More regular in form and thinner than preceding type.*

General characteristics—General characteristics are similar to those of the preceding type; only the flakings are

Ku-C-94

2 Us. $2\frac{3}{4}$ ors.

GIIc(i)

(82)

Left margin

L 16·8 cm
B 9·6 "
T 6·5 "

MKB
28.10.1940

Ku-C-167

1
GIIc(ii)

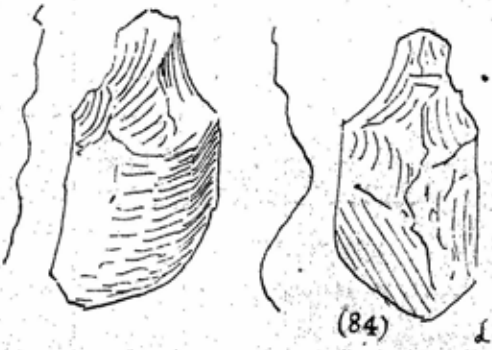
(83)

1 Us.

12·4 cm.
7·7 "
4·8 "

Ku-Sf-84

GIII



(84)

L 14·0 cm
B 7·9 "
T 5·1 "

1 Us. $1\frac{3}{4}$ ors.

MKB
15.7.40

comparatively finer, while there is more of secondary workmanship. This type is also smaller and lighter. The weight varies from 1lb. 11½ oz. to 6¾ oz. and the length from 16·4 cm. to 10·8 cm. Form 5·8% of Family G.

Example (23), Ku-Sf-19: 12·7 cm. × 8·6 cm. × 3·6 cm.; 12¾ oz. About 25 yds. north of junction between Bangriposi and Sirsa Roads, Kuliana.

Rock and Preservation—Quartzite, stained dirty brown. Not rolled.

Primary flaking—Original crust completely worked away. A few irregular flake-scars are present on the dorsal, but are more numerous on the ventral face.

Secondary flaking—The lateral margins are unequally sharp, the left one is comparatively thinner and sharper. This margin has numerous small step-flakings along its length. The right margin also shows some secondary retouch and there is a blunt area a little below the anterior end, which may have served as a finger rest.

G-II-d—*Core tool. Triangular or subtriangular form.*

General characteristics—They are not very different from the almond-shaped bifaces, excepting for the fact that the butt is not rounded, but roughly straight. Of the two examples, one has a weight of 2 lb. 0¾ oz. and the other 1 lb. 8¼ oz. the lengths being 19·4 cm. and 14·7 cm. Form 0·7% of Family G.

Example (24), Nb-72 : 19·4 cm. × 10·4 cm. × 6·0 cm.; 2 lb. 0¾ oz. From the edge of the gravel quarry at Nuaberi.

Rock and Preservation—Quartz-schist, flaggy variety. Stained brown and with heavy ferruginous incrustation. Not rolled.

Primary flaking—Owing to its flaggy nature, many of the larger fractures lie roughly parallel to one another. The irregular character of the butt is due to the same reason. There is no midrib and the anterior is acutely pointed.

Secondary flaking—At both lateral margins, there are numerous small secondary trimmings, most of which are free.

G-II-e-i—*Core tool. Crude workmanship.*

General characteristics—Oblong or ovate in form. Lateral margins convex, meeting at an obtuse or round anterior. Anterior thinner than posterior. Some of these are nearly discoid in form. Thick, with unworked butt, no secondary working, margins are jagged. Weight varies from 2 lb. 15 oz. to $4\frac{3}{4}$ oz. and length from 19·5 cm. to 6·3 cm. Form 35·7% of Family G.

Example (25), Ku-C-94: 16·8 cm. × 9·6 cm. × 6·5 cm.; 2 lb. $2\frac{3}{4}$ oz. Collected in Quarry C in Kamata village.

Rock and Preservation—Fine-grained quartzite, stained brown, with slight ferruginous incrustation. Not rolled.

Primary flaking—Large thick core trimmed to oblong form, with original smooth crust of boulder preserved in a portion of the butt. Flake-scars are extensive and shallow to deep.

Secondary flaking—Secondary retouch present in anterior convex margin and its neighourhood in the lateral margins also.

G-II-e-ii—*Finer workmanship.*

General characteristics—General form is more regularly oblong or ovate. Flaking of more advanced type; butt worked, comparatively thinner than the previous type. The weight varies from 2 lb. $8\frac{1}{4}$ oz. to $6\frac{1}{4}$ oz., the average being 15 oz. approximately. The length varies from 18·1 cm. to 8·4 cm. Form 14·3% of Family G.

Example (26), Ku-C-167: 12·4 cm. × 7·7 cm. × 4·8 cm.; 1 lb. Collected on the surface of ground near Quarry C in Kamata village.

Rock and Preservation—Quartzite, slight ferruginous incrustation. Not rolled.

Primary flaking—Trimmed to oblong shape, moderate patch of original crust present on ventral surface, thickest about two-thirds down from anterior, having an irregular eminence on the dorsal face. No midribs. Primary scars are not clearly distinguishable from one another.

Secondary flaking—Numerous secondary trimmings present along lateral margins, as well as anterior and posterior; many of these being of a stepped character.

G-III—*Irregular bifaces.*

General characteristics—These bifaces, which are all core or pebble tools, cannot strictly be included in any of the previous classes. Four examples have been chosen by way of illustration; but they do not, in any way, exhaust the number of irregular forms found. Form 5.8% of Family G.

Example (27), Ku-Sf-87: 14·0 cm. × 7·9 cm. × 5·1 cm.; 1 lb. $1\frac{3}{4}$ oz. Collected near Quarry D, Kuliana.

Rock and Preservation—Quartzite, with no ferruginous incrustation. Not rolled.

Primary flaking—Large pebble surface extending from middle to posterior of dorsal face. Irregular midrib on ventral face, anterior is obtusely pointed. Left margin of tool is alternately flaked. Right margin is not worked with any such plan; it is only flaked for a short length in the anterior portion.

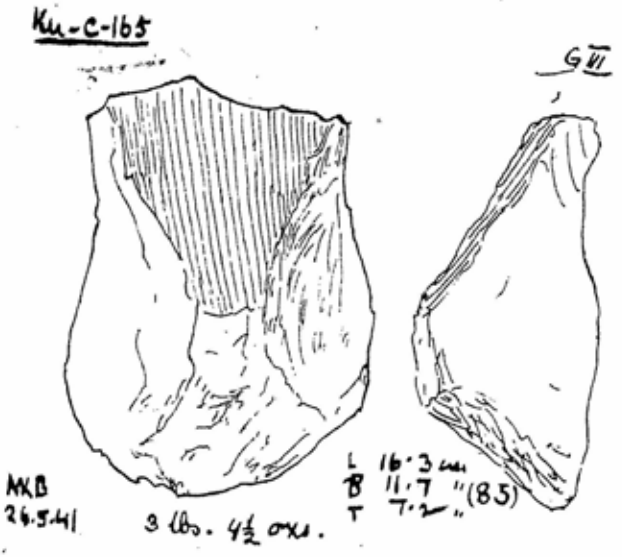
Secondary flaking—None.

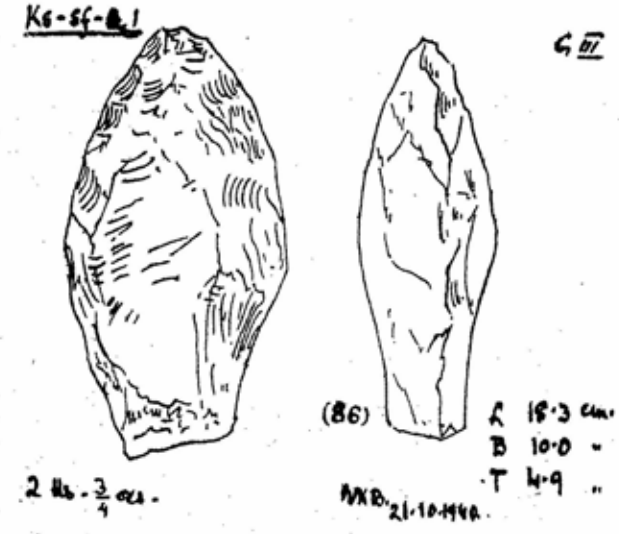
Example (28), Ku-C-165: 16·3 cm. × 11·7 cm. × 7·2 cm.; 3 lbs. $4\frac{1}{2}$ oz. Collected in Quarry C in Kamata village.

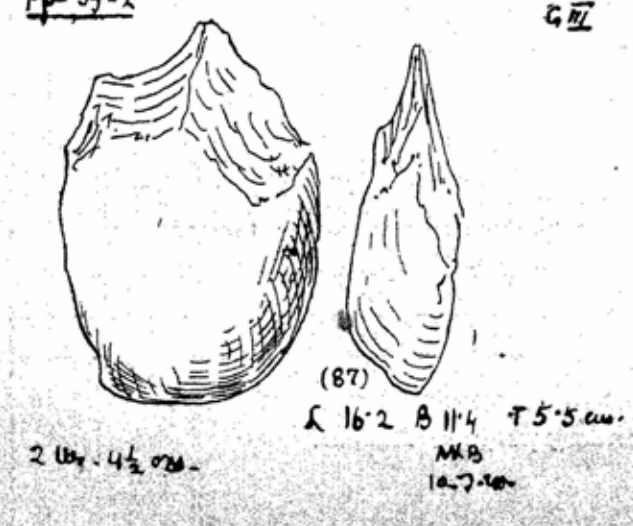
Rock and Preservation—Quartzite, stained brown, with ferruginous incrustation. Not rolled.

Primary flaking—Large object, trimmed to roughly ovate form. Truncated anteriorly. Dorsal face has a very high eminence in the middle, while ventral face is flat. Flake-scars not well-defined.

Secondary flaking—Absent.


Ku-C-165
G VI
MKB
26.5.41
3 lbs. 4½ ozs.
L 16·3 cms.
B 11·7 "
T 7·2 "
(85)


Ks-Sf-8.1
G III
2 lbs. ¾ ozs.
(86)
L 18·3 cms.
B 10·0 "
T 4·9 "
MKB. 21.10.1948.


Pp-Sf-2
G III
(87)
L 16·2 B 11·4 T 5·5 cms.
2 lbs. 4½ ozs.
MKB
10.7.48.

Type—Form is like that of a crude and big heavy handaxe, the anterior of which has been broken.

Example (29), Ks-Sf-1 : 18·3 cm. × 10·0 cm. × 4·9 cm.; 2 lb. 0¾ oz. Collected in a field lying west of Koilisuta village.

Rock and Preservation—Grey flaggy quartzite, no ferruginous stain, but moderate ferruginous incrustation at various points. Not rolled.

Primary flaking—Core tool of elliptical form, lower end thin and broken at the extremity, fracture being old. Primary surfaces are not clearly marked off from one another. Lateral margins are convex, and meet at a slightly rounded point. Right margin thicker than left. The latter shows some step-fractures, which may have resulted from use of tool as a chopper.

Secondary flaking—Numerous along left margin and anterior.

Type—Elliptical biface, which was probably hafted on a split stick, the posterior end being suitably shaped for that purpose. It may also be that this was also originally pointed and was never hafted.

Example (30), Pp-Sf-2 : 16·2 cm. × 11·4 cm. × 5·5 cm.; 2 lb. 4½ oz. Collected in a small gravel quarry, 200 yds. inside jungle, east of 11th milepost on Bangriposi Road.

Rock and Preservation—Quartzite, stained yellow. No ferruginous incrustation. Not rolled.

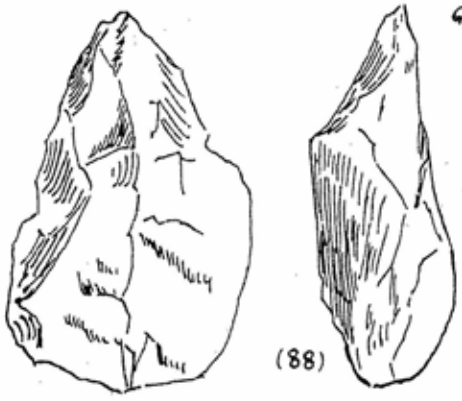
Primary flaking—Roughly oval form with irregular anterior. Dorsal face mostly composed of original crust. Ventral face is nearly flat, but shows some sign of heavy blows at posterior end, which were intended to split the pebble. Anterior cutting edge is formed by intersection of ventral face and sloping flake-surfaces on the dorsal face.

Secondary flaking—Absent.

Type—Cleaver-like tool on split boulder, with pointed anterior.

KB-11

L
GIVa



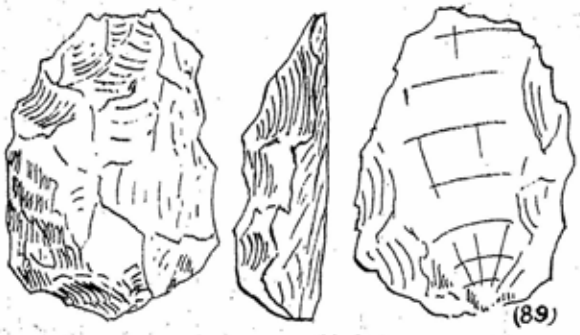
(88)

1 U. 4½ ors.

13·4 cm
9·2 "
4·6 "

KB 56

GIVb



(89)

Flaking angle ?

1 U. ¾ ors.

12·4 cm
8·9 "
3·9 "

Ku-sf-138

L
HIa

(90)

1 U.

9·0 cm.
6·9 "
6·1 "

G-IV—*Flake tools, having the form of bifaces; the ventral face in these cases is a large flake-surface, often showing a bulb of percussion.*

G-IV-a—*Flake tools. Amygdaloidal handaxe on large flake.* There is only one example which is described below. Forms 0·3% of Family G.

Example (31), Kb-11: 13·4 cm. × 9·2 cm. × 4·6 cm.; 1 lb. 4½ oz. Found in an unspecified pit in Kalabaria.

Rock and Preservation—Quartzite, with moderate ferruginous incrustation.

Primary flaking—Ventral face is one flat flake-surface with a bulb of percussion at right of posterior; the posterior extremity of this surface however shows original crust. Striking platform makes ∠ 114° with the ventral face. On the dorsal face, there is a midrib extending from anterior tip to posterior extremity; it reaches the highest point about a third way down from the anterior. Original crust present on this face along right side of rib, the rest of the face is flaked.

Secondary flaking—Absent.

G-IV-b—*Flake tool, resembling ovate type of handaxe.*

General characteristics—Similar to that of ovate handaxes on core, with the difference that the ventral face, in the present instance, is one large flake-surface, which may or may not show some marginal retouch. The weight varies from 1 lb. 8¾ oz. to 10¾ oz. and the length from 16·3 cm. to 12·0 cm. The flaking angle, where determinable, is well over a right angle; the striking platform being either unworked or unifacetted. Form 2·0% of Family G.

Example (32), Kb-56: 12·4 cm. × 8·9 cm. × 3·9 cm.; 1 lb. 0¾ oz. Collected in an unspecified pit in Kalabaria.

Rock and Preservation—Fine-grained quartzite with moderately heavy ferruginous incrustation on the dorsal face only. Not rolled.

KB-VII-13

HIa

(91)

14·5 cm.
11·3 "
5·8 "

2 lbs. 5½ ozs.

MB
9-6-41

Ku-C-129

HIb

(92)

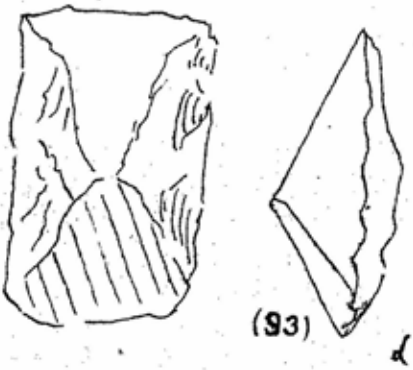
14·9 cm.
10·7 "
4·9 "

MB
15-3-41

1 lb 12¾ ozs.

Ku-C-63

HIIa



(93)

l 13·7
B 8·8
T. 6·0

1 lb 6¼ ozs.

MB
17-8-40.

Primary flaking—The ventral face is one extensive flake surface with a prominent bulb of percussion at the posterior extremity. There are a few marginal primary scars also. The flaking angle cannot be ascertained as the striking platform was subsequently worked off by a strong stroke from towards the ventral face. The dorsal face is convex, having a slight patch of original crust in the middle. There is no midrib. The primary scars are both free and stepped. Anterior is thin, convex; lateral margins are convex.

Secondary flaking—Slight, both free and resolved; confined to margin from side to side across anterior.

H. Cleaver: Cleavers are distinguished from handaxes by the fact that the working edge is present in the anterior. The lateral margins are, moreover, roughly parallel in the majority of cases. 13·72% of total number.

H-I-a—*Pebble tool. Retains a large portion of original pebble surface, sharp anterior at right angles to long axis of the tool. Crude workmanship.*

General characteristics—The anterior working edge may be formed by intersection of two surfaces, or it may be jagged, owing to alternate flaking. The posterior or butt end is thick and the lateral margins are not strictly parallel. These pebble tools are usually thick. Form 11·0% of Familly H.

Example (33), Ku-Sf-138: 9·0 cm. × 6·9 cm. × 6·1 cm.; 1 lb. Collected in Kuliana, exact locality unrecorded.

Rock and Preservation—Quartzite, with no ferruginous incrustation. Not rolled.

Primary flaking—Pebble tool of which the anterior margin is alternately flaked.

Secondary flaking—None, except those due to use. Heavy vertical blows have caused strong stepped platforms on both sides of the jagged edge.

Remarks—This pebble tool was evidently used as a chopper for dealing heavy vertical blows.

Example (34), Kb-7-13: 17·5 cm. × 11·3 cm. × 5·8 cm.; 2 lb. 5½ oz. Collected from an unspecified pit in Kalabaria.

Rock and Preservation—Quartzite with slight ferruginous incrustation. Not rolled.

Primary flaking—Dorsal face is formed of original crust from posterior to anterior. The margins are coarsely trimmed. Ventral face is mostly one major flake-surface. The sharp anterior is formed by the intersection of ventral major flake-surface and the crust on dorsal face.

Secondary flaking—Nil.

H-I-b—*Pebble tool.*

General characteristics—Same as H-I-a in general form, etc., but shows advanced workmanship. Only one example was discovered which is described below. Forms 0·11% of Family H.

Example (35), Ku-C-129: 14·9 cm. × 10·7 cm. × 4·7 cm.; 1 lb. 12¾ oz. Collected in Quarry C in Kamata village.

Rock and Preservation—Quartzite with traces of ferruginous incrustation. Not rolled.

Primary flaking—One of the faces is formed wholly of original rolled boulder surface. The other has shallow and extensive primary scars. Sharp margin everywhere except at the butt, in other words, the lateral margins and the anterior are also sharp.

Secondary flaking—Slight, confined to the two lateral margins only, some being of a resolved character.

H-II-a—*Core tool. Transverse anterior.*

General characteristics—These core tools are thin in the anterior working edge. This edge is formed by the intersection of two extensive surfaces on the dorsal and ventral faces, and is not trimmed any further. Lateral margins are usually parallel. The tool is thickest either at the butt or in the middle. The form of the butt may be (1) square, in which case

the entire tool is rectangular in shape, (2) U-shaped, (3) pointed, in which case, the lateral margins converge posteriorly and (4) with unworked pebble surface. Many cleavers show secondary retouch or good alternate flaking at the lateral margins, which shows that these margins were also intended for use as working edges. The weight varies from 3 lb. 7 oz. to 5¼ oz., the average being 1 lb. 5 oz. The length varies from 18·7 cm. to 8·6 cm. Form 31·9 % of Family H.

Example (*36*), *Ku-C-63* : 13·7 cm. × 8·8 cm. × 6·0 cm. ; 1 lb. 6¼ oz. Collected in Quarry C, Kamata.

Rock and Preservation—Flaggy quartzite with slight ferruginous incrustation. Not rolled.

Primary flaking—Original was not a river-rolled pebble. It was a core having several flat faces produced along joint-planes. On the dorsal face, there is an eminence a little below middle, from which flattish primary surfaces slope away towards the anterior and lateral margins. One of the joint-planes slopes down towards the posterior. Ventral face is flat to convex. Irregularly trimmed anterior working edge is formed by the intersection of two major flake-scars on the two faces.

Secondary flaking—None in the transverse anterior or posterior margins, both of which are sharp. Right lateral margin was subjected to some secondary retouch which has produced a slightly sinuous edge. Left lateral is unretouched.

Type—Transverse cleaver with square butt.

Example (*37*), *Pp-Sf-7* : 17·4 cm. × 8·5 cm. × 4·4 cm. ; 1 lb. 8¾ oz. Collected in a small gravel quarry, 200 yds. east, inside jungle near 11th milepost on Bangriposi Road.

Rock and Preservation—Quartzite, stained brown, with slight ferruginous incrustation. Not rolled.

Primary flaking—No original crust present. Ventral face is flat in the anterior and slightly convex from middle

Pb-Ef-7

HIIa

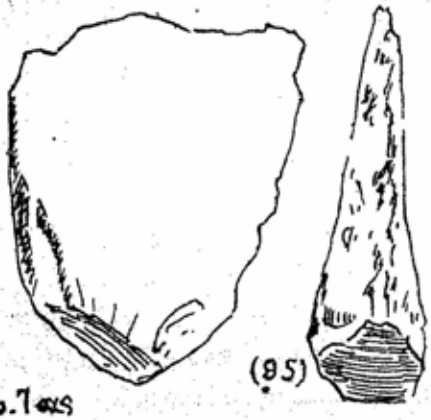
(84)

L 17·4 B 8·5 T 4·4 cm

1 No. 8¾ ozs.

KB 60

HIIa



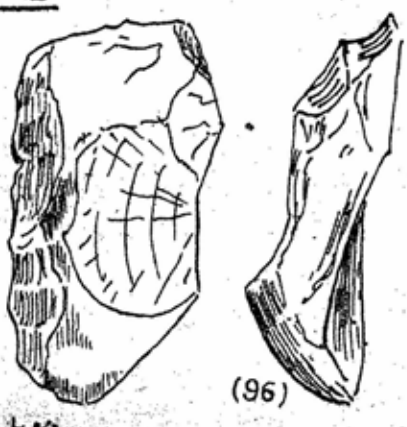
(85)

18·7 cm
15·5 "
5·6 "

3 No. 7 ozs

KB-13

L
HIIa



(96)

19·2 cm
10·6 "
4·5 "

2 No. 4 ozs.

to posterior, due to the presence of a low midrib. Dorsal face is flattish along the middle. But the two margins are nearly wall-like, so that the cross-section is like a trapezium. The anterior working edge is formed by the intersection of two major flake surfaces. Lateral margins are roughly parallel, though slightly convex; they converge posteriorly to meet at the pointed butt end.

Secondary flaking—None at the anterior cutting edge. Some free trimming present at the two lateral margins.

Type—Transverse cleaver with pointed butt and trapezoid section.

Example (38), Kb-60: 18·7 cm. × 15·5 cm. × 5·6 cm.; 3 lb. 7 oz. Collected from an unspecified pit at Kalabaria.

Rock and Preservation—Quartzite with some ferruginous incrustation. Not rolled.

Primary flaking—No original crust present. Trimmed to half an oval form. The butt end is thick, though completely worked. Two extensive flat flake-surfaces on the dorsal and ventral faces meet each other at the transverse, thin and sharp anterior. The lateral margins are trimmed upright. They are divergent anteriorly; the butt being also slightly round in plan.

Secondary flaking—None present.

Type—Transverse cleaver with divergent sides, rectangular section and thick U-butt.

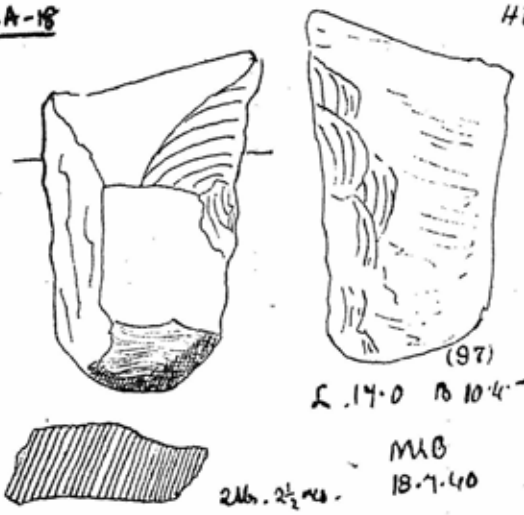
Example (39), Kb-13: 17·2 cm. × 10·6 cm. × 4·5 cm.; 2 lb. 4 oz. Collected in an unspecified pit in Kalabaria.

Rock and Preservation—Fine-grained quartzite with traces of ferruginous incrustation. Not rolled.

Primary flaking—Pebble butt. Original crust extends from there to beyond middle in a thin strip. Dorsal face has an extensive flake-surface in the middle, and a flat sloping flake-scar in the anterior, which was produced before the ventral face. The latter is one single, extensive, concave surface. Lateral margins are

Ku-A-18

HIIb



(97)

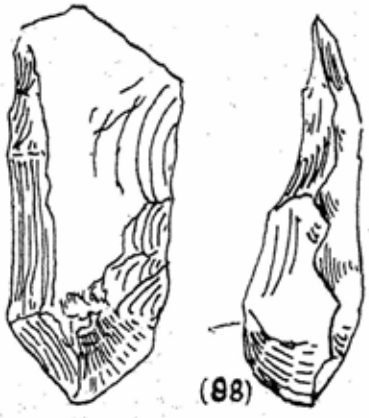
L. 14·0 B 10·4 T. 4·5

MNB
18.7.40

2 lbs. 2½ ozs.

KB-V-3

HIIb



(98)

15·0 cm
6·4 "
3·6 "

11¾ ozs.

ku-sf-80

HIIc(i)

(99)

L 15·0 cm. B 9·6 cm. T 4·5 cm.

N.K.B.
29.5.40

1 lb 5¾ ozs.

trimmed in such a manner that they have become wall-like, though inclined to both ventral and dorsal faces.

Secondary flaking—Some beautiful, controlled flaking present on ventral face at anterior edge and portion of left lateral margin. Two stepped flakings on the dorsal face in the anterior may have been due to vertical blows dealt with the tool.

Type—Transverse cleaver with bevelled anterior edge, rhomboidal section and pebble butt.

H-II-b—*Core tool. Straight cutting edge, obliquely inclined to long axis of tool.*

General characteristics—In most cases, the anterior is without secondary retouch and is formed by the intersection of two large flake-surfaces. The ventral face is frequently flat and largely formed by an extensive flake-surface. With regard to other features, this type is similar to the foregoing one. The weight varies from 2 lb. $2\frac{1}{2}$ oz. to $6\frac{3}{4}$ oz., the average being 1 lb. $3\frac{1}{2}$ oz. The length varies from 18·8 cm. to 9·6 cm. Form 21·9 % of Family H.

Example (40), Ku-A-18: 17·0 cm. × 10·4 cm. × 4·5 cm.; 2 lb. $2\frac{1}{2}$ oz. Collected in Tank A, Kuliana.

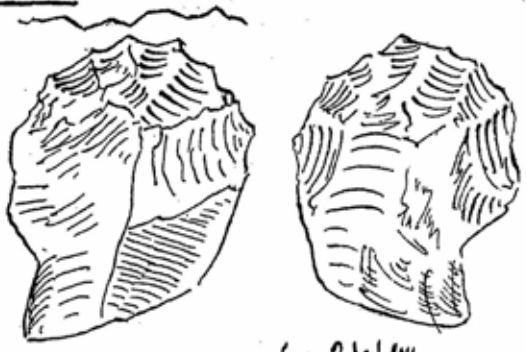
Rock and Preservation—Quartzite, fine-grained. Traces of ferruginous incrustation, uniform grey stain. Not rolled.

Primary flaking—Pebble butt. From this a thin strip of original crust extends some way towards anterior. Large flake-surfaces on the dorsal face, one of which lying in the anterior is Δ in form and slopes down to the cutting edge, which is formed when it intersects the major ventral flake-surface. Both lateral margins are slanting and wall-like, so that the section is rhomboidal. Thickest in the posterior.

Secondary flaking—None.

Type—Guillotine type of cleaver with rhomboidal section and pebble butt.

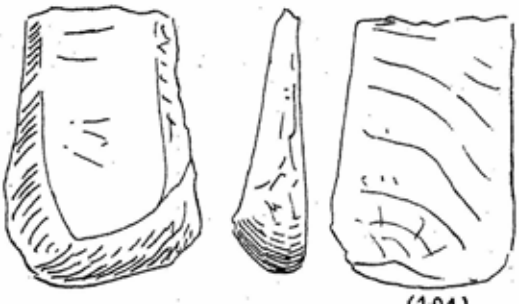
Ku-E-6 HIIIc(N)



L · 21·1 cm
B · 16·1 " MKB
T · 9·1 " 22·7·40.

6 lbs. 6¼ ozs.
Weight –

Ku-C-118 HIIIa

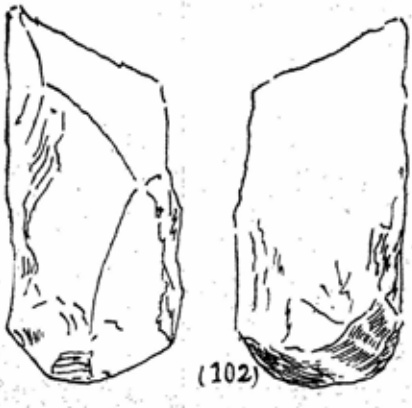


(101)
10·1
7·0
3·0

MKB
11.3.41

8¾ ozs.

Ku-Sh-T3 HIIIb



∠122°

L. 15·9 cm
B. 8·1 "
T. 2·5 "

(102)

1 lb. 4¾ ozs.

MKB
23·7·40.

Example (41), Kb-5-3: 15·0 cm. × 6·4 cm. × 3·6 cm.; 11¾ oz. Collected in Pit 5, Kalabaria.

Rock and Preservation—Grey quartzite, with no ferruginous incrustation. Not rolled.

Primary flaking—Thickest at butt end and thin in the anterior. Original crust present in dorsal face both near butt and in the anterior portion. Right lateral margin shows marked sinuosity, while left is more nearly straight. In the left there is a wall-like slanting area, which would have given tool a rhomboidal section, if it had been repeated on the right margin also. Anterior edge is irregularly oblique.

Secondary flaking—None.

Type—Narrow, long, guillotine cleaver with alternately flaked lateral margin and thick butt, having nearly U-shape.

H-II-c-i—*Core tool. Convex anterior, nearly rectangular form, i.e., lateral margins are almost parallel.*

General characteristics—The range of variation within this class is greater than in the previous classes of cleavers. The main characteristic of this type is its convex anterior, which is frequently retouched or, in several examples, alternately flaked. In other respects, H-II-c-i is similar to H-II-a. The weight varies from 2 lb. 1¼ oz. to 6¼ oz. the average being 1 lb. 4¾ oz.; the length is from 17·4 cm. to 9·0 cm. Form 15·4% of Family H.

Example (42), Ku-Sf-80: 15·0 cm. × 9·6 cm. × 4·5 cm.; 1 lb. 5¾ oz. Collected near Quarry D, Kuliana.

Rock and Preservation—Flaggy quartzite, stained brown, with slight ferruginous incrustation. Not rolled.

Primary flaking—Small patch of original crust present at butt, rest is all flaked. Primary scars are not all clearly demarcated from one another. Thickest at butt. Margins slightly divergent anteriorly.

Secondary flaking—Stepped secondary retouch is present at the convex working edge.

H-II-c-ii—*Core tool. Convex anterior, sides rarely parallel, general form usually irregular.*

General characteristics—This class of core-tools has a convex anterior working edge, which may be formed either by alternate flaking or by the simple intersection of two major surfaces on the dorsal and ventral faces. The form is usually irregular. The weight varies from 6 lbs. 6¼ oz. to 13½ oz. and the length from 21·1 cm. to 10·4 cm. An unusully heavy example is described below. Form 6·6% of Family H.

Example (43), Ku-E-6: 21·1 cm.×16·1 cm.×9·1 cm.; 6 lb. 6¼ oz. Collected in pit near junction of Bangriposi and Sirsa roads, Kuliana.

Rock and Preservation—Quartzite, with brown stain and ferruginous incrustations. Not rolled.

Primary flaking—Large broken boulder of irregular form, having smooth water-worn (?) surface in dorsal face. Ventral face is slightly convex with a low ridge and is flaked all over. Butt end is thick, truncated. Anterior is broad, convex, trimmed to form jagged cutting edge.

Secondary flaking—Absent.

Remark—May be a very heavy chopper as well.

H-III—*Flake tool.* In many of the previous cleavers, particularly in classes H-II-a and H-II-b, the ventral face is flat and formed largely of one flake-surface. Yet these were not counted among flake tools, because there were also other flake-scars besides the principal one on the ventral face. Moreover, the striking platform and bulb of percussion were not visible. In the present class, however, both these symptoms are present. The tools are smaller and lighter, as a general rule. So they should more reasonably be classed as flake tools.

H-III-a—*Flake tool. Transverse anterior edge.*

General characteristics—The anterior working edge is at right angles to the long axis of the tool and without

secondary retouch. It is formed by the intersection of two large surfaces, one on the dorsal and the other on the ventral face. The butt end, in several cases, has the original crust. The weight varies from 1 lb. $2\frac{1}{2}$ oz. to $7\frac{1}{4}$ oz., the average being 12 oz.; the length is from 13·5 cm. to 9·3 cm. Form 6·6% of Family H.

Example (44), Ku-C-118: 10·1 cm. × 7·0 cm. × 3·0 cm.; $8\frac{3}{4}$ oz. Collected in Quarry C, Kamata village.

Rock and Preservation—Quartzite, stained brown, but with no ferruginous incrustation. Not rolled.

Primary flaking—Original crust present at the butt end. From this an extensive shallow flake-surface slopes down to the anterior margin; this was evidently produced before the tool was knocked off from the core. The lateral margins are wall-like and converge upwards; so that the tool has a trapezoid section. These were produced by short and lighter strokes. The ventral face is one extensive flake-surface with a low bulb of percussion at the posterior extremity. The unworked butt end formed the striking platform, the flaking angle being 100°.

Secondary flaking—Absent in the anterior, though it shows damage due to use.

H-III-b—*Flake tool. With oblique cutting edge in anterior.*

General characteristics—The working anterior edge is formed by the intersection of the ventral flake-surface and a short flat suface which slopes down from the dorsal plane towards the anterior, giving the anterior a bevelled effect. The weight varies from 1 lb. $11\frac{1}{2}$ to 10 oz. and the length from 15·9 cm. to 11·2 cm. Altogether three examples were found in which the flaking angles were 108°, 120°, 122°, one of them having a unifacetted striking platform. Form 3·3% of Family H.

Example (45), Ku-Sf-73: 15·9 cm. × 8·1 cm. × 3·5 cm.; 1 lb. $4\frac{3}{4}$ oz. Collected near Quarry D, Kuliana.

Ku-Sf-82

HIIIc

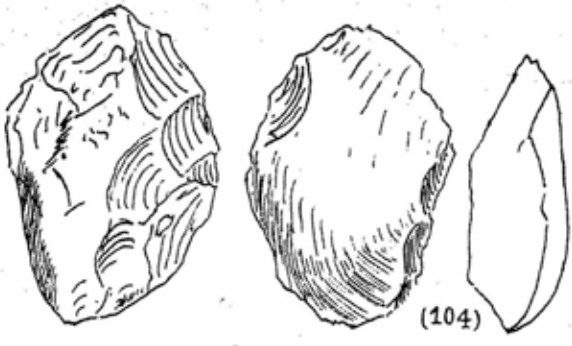
(103)

L. 12·3 cm MB
B. 7·5 " 22.7.40.
T. 3·2 "

12½ ozs.

Ku-Sf-7

IIa



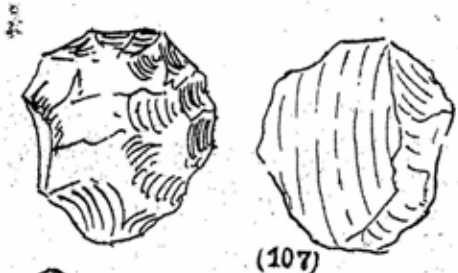
(104)

L. 11·5 cm B. 8·1 m. T. 4·5 cm.

14¾ ozs.

Ku-Sf-76

IIc



(107)

L. 7·4 cm
B. 7·1 " MB
T. 3·9 " 22.7.40

8½ ozs.

Rock and Preservation—Fine-grained quartzite, stained brown, with no ferruginous incrustation. Not rolled.

Primary flaking—The butt preserves a portion of the original crust. Both dorsal and ventral faces are nearly parallel, the two lateral margins are trimmed nearly upright. The anterior is oblique. The ventral face is slightly concave in the anterior portion. The butt forms the unworked striking platform, the flaking angle being ∠ 122°. The bulb has been partly worked away.

Secondary flaking—None.

H-III-c—*Flake tool. With convex cutting edge in anterior.*

General characteristics—The anterior shows some amount of trimming intended to produce the convex edge. Two examples were found with weights 1 lb. 1½ oz. and 12¼ oz., and lengths 12·3 cm. and 11·6 cm. Form 2·2% of Family H.

Example (46), Ku-Sf-82: 12·3 cm. × 7·5 cm. × 3·2 cm.; 12¼ oz. Collected near Quarry D, Kuliana.

Rock and Preservation—Quartzite, stained brown; but with no ferruginous incrustation. Not rolled.

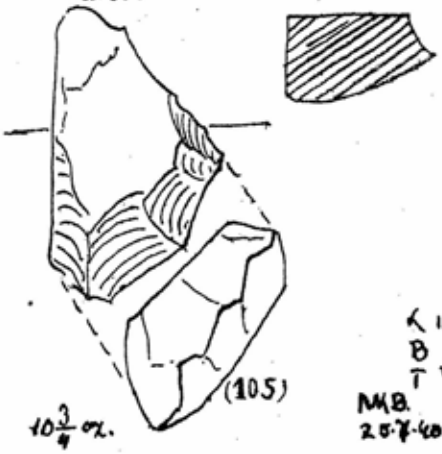
Primary flaking—No original crust is present. The butt is thick, flaked and nearly rectangular. Both surfaces are fully flaked and covered by extensive shallow scars. The ventral face is nearly flat with an erraillure in place of the bulb and the striking platform is unifacetted forming a flaking angle of 118°. The lateral margins are both wall-like, each wall being oblique to both dorsal and ventral faces, so that the section of the tool is rhomboidal.

Secondary flaking—The convex anterior has been brought to that form by a series of small trimmings directed from the ventral towards the dorsal face.

Remarks—Excepting for the presence of the unifacetted, striking platform and the erraillure in place of the bulb,

Ku-Sf-100 I·II

Posterior

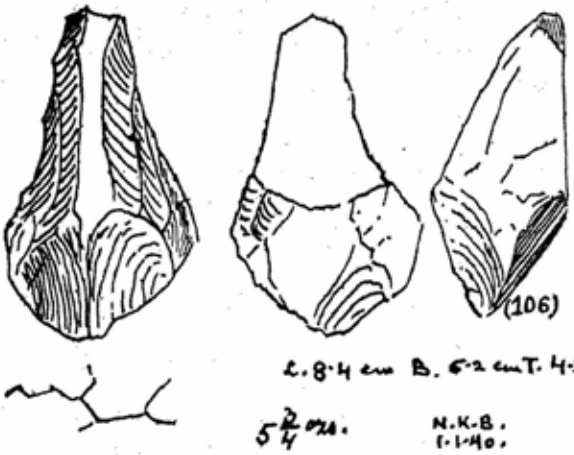


(105)

L 10·9 cm
B 6·5 "
T 4·0 "

× $10\frac{3}{4}$ oz. MB. 25·7·40.

Ku-Sf-11 I II

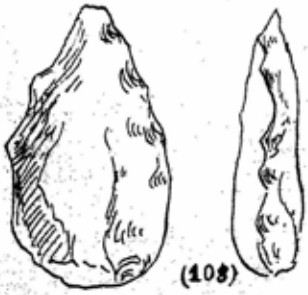


(106)

L. 8·4 cm B. 5·2 cm T. 4·3 cm.

$5\frac{2}{4}$ oz. N.K.B. 1·1·40.

Ku-C-122 II



(108)

9.9 cm
6.7 "
2.6 "

MB $5\frac{3}{4}$ oz.
1.3.41.

this tool would have otherwise been classed under H-II-c-i.

I. Scraper: Many of these scrapers are, in fact, small bifaces with a convex working edge at one of the lateral margins. Scrapers on flakes are few in Mayurbhanj. 2·56% of total number.

I-I-a—*Core tool. Convex or sub-convex working edge at one lateral margin.*

General characteristics—The convex margin frequently shows alternate trimming. The opposite lateral margin is often thick, occasionally even unworked. The weight varies from 14¾ oz. to 2 oz. and the length from 11·5 cm. to 4·9 cm. Form 64% of Family I.

Example (47), Ku-Sf-7: 11·5 cm. × 8·7 cm. × 4·5 cm.; 14¾ oz. Collected near inspection bunglow, Kuliana.

Rock and Preservation—Quartzite. Not rolled.

Primary flaking—Original rounded surface present all over ventral face. Dorsal face is trimmed incompletely, left margin being thick like a holder, the right being convex, with one-sided trimming.

Secondary flaking—None.

I-I-b—*Flake tool. Scraping edge is convex and limited to one lateral margin.*

General characteristics—The ventral face in these tools is one extensive flake-surface. The cutting edge is convex and limited to one lateral margin, the opposite margin being thick and useful as a holder. The weight varies from 8½ oz. to 3 oz. and the length from 7·4 cm. to 6·5 cm. Form 18% of Family I.

Example (48), Ku-Sf-76: 7·4 cm. × 7·1 cm. × 3·9 cm.; 8½ oz. Collected near Quarry D, Kuliana.

Rock and Preservation—Greenish grey rock, possibly diorite; with whole surface patinated to its present colour. One fresh fracture shows that original colour of rock is black. Not rolled.

Primary flaking—Thick lateral margin in the right; the left being the thin, convex working edge. Ventral face is slightly convex, one flake-surface. Bulb of percussion or striking platform are not clearly discernible.

Secondary flaking—Slight stepped retouches at the working edge are present.

I-II—*Core tool. Small working edge at one of the longitudinal ends of tool.*

General characteristics—The scraping edge is not extensive, and is limited to a short length in the anterior or posterior. Three examples were found, the weights of which vary from $10\frac{3}{4}$ oz. to 4 oz., and the length from 10·9 cm. to 6·8 cm. Form 11% of Family I.

Example (49), Ku-Sf-100: 10·9 cm. × 6·5 cm. × 4·0 cm.; $10\frac{3}{4}$ oz. Collected near Quarry D, Kuliana.

Rock and Preservation—Quartzite, with no ferruginous incrustation. Not rolled.

Primary flaking—Roughly triangular form with both lateral margins thick. Working edge is alternately trimmed, and confined to anterior end. It is nearly straight when viewed from above.

Secondary flaking—Not present.

Remarks—The working edge though confined to the anterior extremity, is not very limited in extent.

Example (50), Ku-Sf-11: 8·4 cm. × 5·2 cm. × 4·3 cm.; $5\frac{3}{4}$ oz. Collected in Kuliana; exact locality unrecorded.

Rock and Preservation—Quartzite, with slight ferruginous patches. Not rolled.

Primary flaking—Thick, roughly triangular, with pointed base. The dorsal surface has parallel flake-surfaces in the anterior, the ventral face underneath being flat, the result of jointing. Posterior end is deeply flaked, and has a sinuous character.

Secondary flaking—Not present.

Remarks—It is an end-scraper of ogival type.

J.—Point: In form and process of manufacture, many of these are indistinguishable from small bifaces pointed anteriorly. But their size places them in a separate class from handaxes. 1·66% of total number.

J-I—*Core tools.*

General characteristics—In form these are mostly like amygdaloidal bifaces with a fairly pointed anterior. The anterior extremity is retouched in a few cases only. The weight varies from 7 oz. to 3 oz., and the length from 10·1 cm. to 7·0 cm. Form 90·9% of Family J.

Example (51), Ku-C-122: 9·9 cm. × 6·7 cm. × 2·6 cm.; $5\frac{3}{4}$ oz. Collected in Quarry C within village Kamata.

Rock and Preservation—Medium-grained quartzite with deep brown stain, but no ferruginous incrustation. Not rolled.

Primary flaking—Both faces fully worked. Small, amygdaloidal in form, thick posterior, thin anterior. Original crust is not present anywhere.

Secondary flaking—Some present at lateral margin near anterior end.

J-II—*Flake tool*: One, rather obtuse point was found on a flake.

Example (52), Nb-20: 9·6 cm. × 6·6 cm. × 3·6 cm.; $7\frac{1}{2}$ oz. Collected in an unspecified pit at Nuaberi. Forms 9·1% of Family J.

Rock and Preservation—Vein-quartz, with ferruginous stain, but no incrustation. Not rolled.

Primary flaking—There is a unifacetted striking platform at an angle of 124° with the nearly flat ventral face, which is, on the whole, one flake-surface. On the convex dorsal face, the flake-scars spread fanwise from the centre. They were apparently executed after detachment of the flake; hence technique is not Levalloisian.

Secondary flaking—Anterior portion is obtusely pointed and with good secondary trimming.

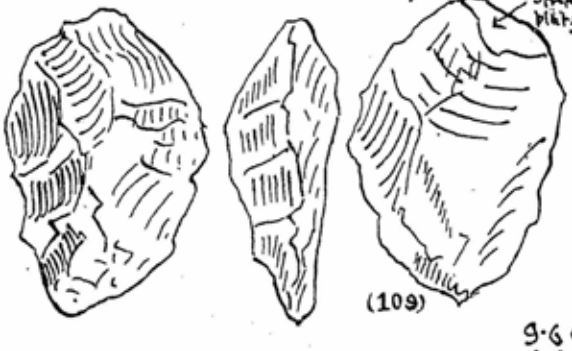
Type—Obtusely pointed tool on flake.

NB 29

L JII

∠ 124°

Striking platform



(109)

9·6 cm.
6·6 ..
3·6 ..

7½ ozs.

NB69

L K

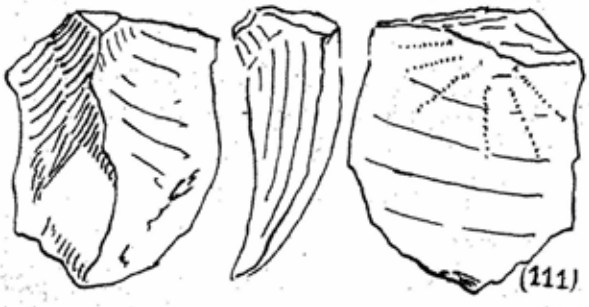
(110)

14·3 cm.
11·0 .
9·5 .

4 lbs ½ oz.

KB-BMG-4

M



(111)

12·5 cm.
10·4 .
4·9 ..

1 lb 2½ ozs.

Miscellaneous forms: 1·20 % of total number.

K. *Knapped cores*: Two examples only were found, one being small and the other big, weighing 4 lbs. ½ oz. They have irregularly placed flake-scars all over.

Example (53), Nb-69 : 14·3 cm × 11·0 cm. × 9·5 cm.; 4 lb. 0½ oz.

Flaking—Irregular, all over body.

Remark—May be an unfinished biface.

L. *Small irregular forms*: These do not conform to any general pattern. They may have been pieces, rejected in process of manufacture of standard types.

M. *Flakes showing Levallois technique of manufacture.* Only three examples were found, and their form was such that they could not be placed exactly under any of the standard types. But, in their manufacture, the process employed was one resembling Levallois technique.

Example (54), Kb-Bmg-4: 12·5 cm. × 10·4 cm. × 4·9 cm.; 1 lb. 2¼ oz. Collected in pit west of road at Brahmangaon village, between mileposts 12 and 12¼ from Baripada.

Rock and Preservation—Quartzite with slight ferruginous incrustation. Not rolled.

Primary flaking—Polygonal form, midrib on dorsal face, with flake-scars running on both sides. Ventral face is convex, singular flake-surface with bulb. Striking platform is unifacetted (bi-facetted?) making an angle of 135° with the ventral face. Anterior obtusely pointed. Margins unretouched, but sharp.

Secondary flaking—Absent.

Type—Large flake tool showing crude Levallois technique, resembling ovate biface in form. (Scraper ?)

N. *Irregular flakes.* Possibly waste-flakes.

VII. STATISTICAL STUDY OF TOOLS NOT FOUND IN SITU

50. Distribution Tables

The distribution of tools is shown in the three accompanying tables. Table I shows the detailed distribution of types and subtypes, while Table II gives us the distribution of major tool-families according to localities. Table III records the number of pebble, core and flake tools in each site.

51. Pebble, Core, Flake

The total number of artifacts incorporated in the following tables is 663. The percentage of pebble, core and flake tools is as follows :

	Percentages
Pebble	12·21
Core	81·29
Flake	6·48
	99·98

Cores thus form, by far, the largest number, and pebble tools are about twice as many as flake tools.

52. Proportion of different tool families

	Percentages among tools found not in situ.	Percentages among tools found in situ.
	Total	Total
	663	57
Round chopper	10·56	10·5
Side chopper	13·72	12·3
Knife	6·63	8·7
Rostrocarinate	0·30	Nil
Rostroid handaxe	5·24	3·5
Handaxe	44·34	38·5
Cleaver	13·72	12·3
Scraper	2·56	8·7
Point	1·66	3·5
Miscellaneous	1·20	Nil
	99·83	98·0

TABLE ONE

	Symbol of Type	Brief Character	Bhuasuni	Brahmangaon	Buramara	Kalabaria	Kamata	Kendudiha	Koilisuta	Kuliana	Mundaboni	Nuaberi	Pariakoli	Patinja	Pratappur	Sandim	Unrecorded site	Total
Round Chopper	*A*-I	Pebble tool. Nearly circular form with sharp margin, either wholly or nearly all around.	...	...	...	...	...	2	...	2	...	1	...	...	...	...	...	5
	A-II-*a*	Core tool. Heavy, round or square	...	...	...	6	...	1	...	13	2	5	...	...	1	...	...	28
	A-II-*b*	Core tool. Smaller type, discoidal	...	1	...	9	...	5	1	19	...	1	...	...	...	1	...	37
Side Chopper	*B*-I-*a*	Pebble tool, working edge jagged or alternately flaked, confined to one convex lateral margin.	1	...	...	6	1	...	...	11	...	2	...	1	...	1	2	25
	B-I-*b*	Pebble tool. Working edge produced by one-sided flaking	...	...	...	3	...	...	...	5	...	...	...	...	...	...	...	8
	B-II-*a*	Core tool. One jagged lateral margin; opposite edge is designed to serve as holder.	...	...	1	12	...	...	...	13	...	5	...	...	1	2	...	34
	B-II-*b*	Core tool. Working edge produced by one-sided flaking. Thick holder opposite.	...	...	...	...	...	...	...	2	...	..	...	...	...	...	...	2
	B-III	Flake tool. Natural or unifacetted striking platform; obtuse flaking angle.	...	1	...	5	...	...	...	3	...	1	...	...	...	...	1	11
	C	Core tool. No holder opposite the working edge. Irregular forms.	...	...	...	7	...	...	...	2	...	2	...	...	...	...	...	11
Knife (Thick)	*D*-I	Pebble tool. Holder absent, working edge nearly straight; lateral margins converge slightly towards anterior.	...	...	...	1	...	...	...	7	...	...	...	...	...	...	...	8
	D-II-*a*	Core tool. Lateral margins run roughly parallel; they are usually worked asymmetrically.	...	...	1	6	...	2	...	11	...	1	...	...	1	...	...	22
	D-II-*b*	Core tool. Form is on the whole rectangular, both faces are nearly flat.	...	...	...	1	...	...	1	4	...	...	...	...	...	...	...	6
	D-III-*a*	Flake tool. With irregularly parallel sides which are sharp	...	...	...	...	...	...	...	7	...	...	...	...	...	...	...	7
	D-III-*b*	Flake tool. Resembles cleaver in form but has thick anterior or posterior.	...	...	...	...	...	...	...	1	...	...	...	...	...	....	...	1
Rostro-carinate Rostroid Handaxe	*E*	Core tool.	...	...	...	..	...	...	...	2	...	...	...	...	...	...	...	2
	F	Core tool. Roughly like handaxes, but with sharp △ or rhomboidal cross-section in the anterior.	...	...	...	14	1	1	...	10	...	7	...	1	...	1	...	35

TABLE ONE (*Contd.*)

	Symbol of Type	Brief Character	Bhuasuni	Brahmangaon	Buramara	Kalabaria	Kamata	Kenduḍiha	Koilisuta	Kuliana	Mundaboni	Nuaberi	Pariakoli	Patinja	Pratappur	Sandim	Unrecorded site	Total
Handaxe	*G*-I-*a*	Pebble tool. Roughly resembling handaxe of other than ovate type.	...	...	...	5	1	2	...	8	...	1	1	...	3	...	...	21
	G-I-*b*	Pebble tool. Roughly oval in form	...	...	...	...	...	...	...	4	...	...	...	...	...	...	...	4
	G-II-*a*	Core tool. Large heavy handaxe with pebble butt and broad anterior.	...	...	...	4	...	1	...	7	...	3	...	...	1	...	...	16
	G-II-*b*	Core tool. Peariform type.	...	...	...	6	...	1	2	5	...	..	...	...	...	...	1	15
	G-II-*c*-i	Core tool. Almond shaped, of crude workmanship	1	...	...	15	...	3	1	5	...	3	...	...	...	...	1	29
	G-II-*c*-ii	Core tool. Almond shaped, of more regular form and thinner than *G*-II-*c*-i.	...	...	...	2	...	1	3	10	...	1	...	...	...	...	...	17
	G-II-*d*	Core tool. Triangular or Subtriangular in form	...	...	...	...	..	...	...	1	...	1	...	...	...	...	...	2
	G-II-*e*-i	Core tool. Oblong or ovate, thick, with worked butt, no secondary retouch.	2	2	38	3	1	1	46	...	8	...	1	1	...	2		105
	G-II-*e*-ii	Core tool. Ovate or oblong. Flaking of more advanced type. Worked butt, thinner than *G*-II-*e*-i.	...	1	1	12	...	2	2	16	...	7	...	...	...	1	...	42
	G-III	Core tool. Irregular bifaces	...	...	...	5	...	1	1	5	...	2	...	...	2	...	1	17
	G-IV-*a*	Flake tool. Amygdaloidal form	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1
	G-IV-*b*	Flake tool. Resembling ovate handaxe	...	...	...	3	...	...	...	2	...	...	...	...	...	...	1	6
	G	Core tool. Broken bifaces	...	...	...	7	...	3	...	7	...	1	...	...	...	...	1	19

TABLE ONE (*Contd.*)

Symbol of Type	Brief Character	Bhuasuni	Brahmangaon	Buramara	Kalabaria	Kamata	Kendudiha	Koilisuta	Kuliana	Mundaboni	Nuaberi	Pariakoli	Patinja	Pratappur	Sandim	Unrecorded site	Total,
H-I-*a*	Pebble tool. Sharp, transverse, jagged anterior at right angles to long axis of tool. Pebble butt.	...	...	...	5	...	...	...	5	...	...	...	...	...	...	...	10
H-I-*b*	Pebble tool. Same as above, but with more advanced workmanship.	...	..	...	...	...	...	...	1	...	...	...	...	...	...	...	1
H-II-*a*	Core tool. Transverse edge unretouched	...	...	...	9	...	...	...	11	...	5	...	...	2	1	1	29
H-II-*b*	Core tool. Guillotine type	...	1	...	9	...	...	1	5	...	4	...	...	...	...	...	20
H-II-*c*-i	Core tool. Convex anterior	...	...	...	4	...	1	1	5	...	3	...	...	...	...	...	14
H-II-*c*-ii	Core tool. Sides rarely ‖, general form usually irregular	...	...	...	2	...	...	...	4	...	...	...	...	...	...	...	6
H-III-*a*	Flake tool. Transverse anterior edge	...	...	...	2	...	1	...	3	...	...	...	...	...	...	...	6
H-III-*b*	Flake tool. Guillotine type	...	...	...	1	...	...	...	2	...	...	...	...	...	...	...	3
H-III-*c*	Flake tool. Convex anterior	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	2

16—1681B

TABLE ONE (*Contd.*)

	Symbol of Type	Brief Character	Bhuasuni	Brahmangaon	Buramara	Kalabaria	Kamata	Kenduditha	Koilisuta	Kuliana	Mundaboni	Nuaberi	Pariakoli	Patinja	Pratappur	Sandim	Unrecorded site	Total
SIDE-SCRAPER	*J*-I-*a*	Core tool. Convex or subconvex; working edge at one lateral margin, small or medium size.	...	...	...	4	...	1	...	5	1	...	...	...	...	...	...	11
	J-I-*b*	Flake tool. Do	...	...	...	...	...	...	...	3	...	...	...	...	...	..	...	3
END-SCRAPER	*J*-II	Core tool. Small working edge at one of the longitudinal ends of tool	...	...	...	1	...	...	...	2	...	...	...	...	...	...	...	3
POINT	*J*-I	Core tool. Indistinguishable in form from small amygdaloidal biface, except for its size.	...	...	...	2	...	1	...	7	...	...	...	...	...	...	...	10
	J-II	Flake tool	...	...	...	...	...	...	...	...	1	...	...	..	...	...		1
MISCELLANEOUS	*K*	Knapped core	...	...	...	...	...	1	...	...	1	...	...	...	...	...		2
	L	Core tool. Small irregularly shaped artifacts	...	...	...	...	...	...	...	4	...	...	...	...	...	...	...	4
	M	Flake tool. Irregular flakes showing Levallois technique of crude type.	...	1	..	...	...	...	...	1	...	...	...	...	...	...	...	2

TABLE TWO

Site	Round Chopper	Side Chopper	Knife	Rostro-Carinate	Rostroid Handaxe	Handaxe	Cleaver	Scraper	Point	Miscel-laneous	Total
Bhuasuni	...	1	...	...	...	1	...	...	...	...	2
Brahmangaon	1	1	...	...	...	3	1	...	...	1	7
Buramara	...	1	1	...	...	3	...	...	...	...	5
Kalabaria	15	33	8	...	14	98	32	5	2	...	207
Kamata	...	1	...	...	1	4	...	...	...	...	6
Kendudiha	8	...	2	...	1	15	2	1	1	1	31
Koilisuta	1	...	1	...	...	10	2	...	...	...	14
Kuliana	34	36	30	2	10	116	38	10	7	5	288
Mundaboni	2	...	...	...	...	...	...	1	...	...	3
Nuaberi	7	10	1	...	7	27	12	...	1	1	66
Pariakoli	...	...	...	...	...	1	...	...	...	...	1
Patinja	...	1	...	...	1	1	...	...	...	...	3
Pratappur	1	1	1	...	...	7	2	...	...	...	12
Sandim	1	3	...	...	1	1	1	...	...	...	7
Unrecorded sites	...	3	...	...	...	7	1	...	...	...	11
Total	70	91	44	2	35	294	91	17	11	8	663
Percentages	10·56	13·72	6·63	0·30	5·24	44·34	13·72	2·56	1·66	1·20	99·83

TABLE THREE

	Pebble tools	Core tools	Flake tools
Bhuasuni	1	1	...
Brahmangaon	...	5	2
Buramara	...	5	...
Kalabaria	20	175	12
Kamata	2	4	...
Kendudiha	4	26	1
Koilisuta	...	14	...
Kuliana	43	221	24
Mundaboni	...	3	...
Nuaberi	4	60	2
Pariakoli	1	...	...
Patinja	...	3	..
Pratappur	3	9	...
Sandim	1	6	...
Unrecorded sites	2	7	2
Total	81	539	43
Percentages	12·21	81·29	6·48=99·98

The largest number of tools is comprised by choppers, handaxes and cleavers. Discoid choppers constitute 10·56% and side-choppers 13·72%. If rostroid handaxes are taken along with handaxes and cleavers, their total reaches 63·3% ; scrapers and points together forming just over 4% of the whole.

When these proportions are compared with the proportion of tool-families among *in situ* tools, an interesting light is thrown on the nature of the surface or loose finds from gravel pits. It will be observed that the general resemblance between the two tables is fairly great. But among *in situ* tools, handaxes are a shade less numerous. This may be accidental, or it may be due to the fact that the Public Works Department, while digging for gravel in comparatively shallow and extensive pits, laid bare a larger proportion of tools from upper horizons than from lower. Scrapers and points were however more numerous in the excavations. The reason for this may be two-fold; either the deeper layers do contain more scrapers and points in comparison with other types or perhaps in our superficial investigations, we were more on the look-out for large-sized well-finished tools, and so, many of the smaller points and scrapers may have escaped our attention. The latter seems to be the more likely explanation of the observed difference under these two heads in the two tables.

53. Proportion of Subtypes within important Tool Families.

An examination of the proportion of different subtypes within the principal tool-families throws some interesting light on the typological position of the Kuliana Industry. We shall here confine ourselves to the surface and loose finds from within pits only.

(*a*) *Round choppers* : 93·8% of these discoidal choppers are from cores and 7% from pebbles. Among the former, the majority, 52·8%, is formed by discoids of comparatively small size and light weight, while heavy, round or squarish ones form 40%.

(*b*) *Side choppers* : Pebbles form 36·3%, Cores 51·7% and Flakes 12·2%.

The largest single subtype, namely B-II-a is a core-tool with a jagged lateral margin and thick holder on the opposite side. Similar tools, in which the pebble surface constitutes a large proportion, come next with a value of 27·5%. Flakes with a natural or unifacetted striking platform and an obtuse flaking angle form a fairly high proportion with 12·2%.

(c) *Knife:* Heavy knives with more or less straight margins running nearly parallel are formed of pebbles, cores and flakes in the following proportion: Pebbles 18·2%, Cores 63·6% and Flakes 18·2%.

On the whole, these also show crude workmanship except for subtype D-III-b which constitutes a meagre 2·3% of the whole. The largest number is formed by core tools whose lateral margins are nearly parallel and flaked asymmetrically, one being sharper and more neatly flaked than the other.

(d) *Handaxe*: Among handaxes, Pebbles constitute 8·4% Cores 89·2% and Flakes 2·3%.

The largest single share of 35·7% is formed by oblong or ovate core tools with unworked butt and no secondary retouch. Slightly advanced tools of the same form, but thinner and with worked butts follow with 14·3%. So ovate and oblong handaxes on core form altogether 50·0%. Of flake tools, again, the majority is ovate in form, 2·0%, while amygdaloidal forms constitute only 0·3% of the total.

Next to ovate and oblong forms, are almond-shaped handaxes with a total of 15·7%, of which 9·9% are crude and 5·8% are finely shaped and delicately trimmed.

(e) *Cleaver*: Pebbles constitute 11·11%, Cores 75·8% and Flakes 12·1%.

The largest single subtype is formed by core tools with a transverse working edge. Among flakes and pebbles too, it is the transverse form which predominates. As a matter of fact, transverse cleavers altogether total 49·61%, guillotine-edged ones 25·2% and those with a convex anterior 17·6%. Core tools with roughly parallel sides and of irregular form constitute a minority of 6·6%.

VIII. CONCLUSION

54. General Observations

(*i*) The industry of Kuliana is mainly a core-industry with an important addition of pebbles and a small admixture of flakes with high flaking angle and unprepared or unifacetted striking platforms.

(*ii*) Handaxes and choppers predominate and, in the former class, ovate and oblong types are more numerous than almond forms showing better flaking technique. Rostroid handaxes, which are obviously cruder, are well represented, while crude knives with roughly straight and parallel sides, and with an anterior end not designed for use, form an important part of the whole.

Flake tools are, on the whole, few. Tools resembling Clactonian forms are represented, but none are prepared in the Levalloisian way. A very small number of flakes however show a Levalloisian manner of working, but the tools turned out are crude, or perhaps are merely waste flakes knocked off during manufacture of other tools.

Thus tools of an advanced type are, on the whole, few in comparison with more primitive ones.

(*iii*) When we review these tools in the light of the findings recorded in Section 48, it might be said that the Kuliana Industry extended over a period when skill in flaking quartzite or in producing regular forms was not very highly developed. There was however a distinct growth in skill, leading to newer methods of flaking, as upon an anvil, or growth of skill in secondary retouch, or in the production of new tools like advanced amygdaloidal bifaces and various forms of cleavers. But the majority of tools is characterized by mediocre skill. Judging from their number, this must indicate that progress was restricted during a considerable period of time.

55. Correlations and future Line of Work

The Kuliana Industry naturally shows a certain amount of agreement with industries from other parts of India, as well as

of Africa. Thus discoid and side-choppers, like types B-I-a, B-I-b, etc., are similar to Wayland's Early Kafuan and Leakey's Oldowan industries of East Africa (Leakey, *Stone Age Africa*, 1936, pp. 38ff). They are also similar to the pebble tools from the Punjab described by Paterson in De Terra and Paterson : *Studies in the Ice-Age in India and Associated Human Cultures*, 1939, pp. 305ff. Some of the handaxes of Kuliana, particularly the large ones having a heavy butt and broad anterior, are not unlike Stellenbosch coups-de-poing described by Burkitt in *South Africa's Past in Stone and Paint*, 1928, pp. 59ff and illustrated in fig. VI. Some cleavers from Kuliana show a rhomboidal section as in one from Pniel illustrated by Burkitt in fig. IX. A rather narrow, long, pick-like handaxe found *in situ* (No. 47, Kb-6C-1), with a roughly rhomboidal section, is similar to a tool described and illustrated by Sandford in his *Paleolithic Man and the Nile Valley in Upper and Middle Egypt*, 1934, p. 111 and plate XIX.

But all this does not carry us very far. None of these single types or subtypes has a restricted zonal distribution and a consequent high index value. All that we may say on the basis of such evidence is that the typological age of Kuliana Industry, suggested by these numerous resemblances, is Lower Palaeolithic. Perhaps it was rather early than late, because handaxes of cruder forms are comparatively more numerous and well-finished tools are few. But this need not necessarily mean that the industry of Kuliana was necessarily homotaxial with similar industries in other portions of India or Africa. They may have been so, or may not have been so. It is necessary therefore to fix accurately the date of the Kuliana Industry on the basis of local geological evidence, first of all, and then try to correlate it with regions yielding the same or comparable types of human artifacts.

56. In their *Studies on the Ice-Age in India and Associated Human Cultures*, De Terra and Paterson have described a section of the Narbada valley which is comparable to the section exposed near Kamarpal in Mayurbhanj and described in Section 21. In the Narbada section there was first a coarse cemented conglomerate bed overlain by a red silty clay with lime concretions (p. 316). The conglomerate yielded some

fossils, *Hexaprotodon namadicus* and *Bos*, and a few rolled and rather crude artifacts resembling handaxes and choppers (plate XXXII). The upper clay yielded several unrolled flakes and a fresh Acheulean biface. De Terra is of opinion that the basal conglomerate is Middle Pleistocene, and on typological grounds, is equable with the terrace deposits of the Punjab.

Our section at Kamarpal has not yielded any fossils, nor do we feel justified in correlating them with sections in the Punjab or the Narbada or in Madras (see Section 16) on the basis of typological evidence alone. Moreover, the few flakes and flaked cores resembling artifacts which have so far come from the bed, can be satisfactorily accounted for by natural causes alone (Sections 28, 29).

Future work in Mayurbhanj should therefore be carried on in the region of Kamarpal and its neighbourhood, in the hope of discovering fossils and artifacts from the conglomerate bed itself or from those underlying or overlying it, so that some dependable scale can be set up by means of which we can date the culture-bearing laterite beds near by with a reasonable amount of certainty.

———

RECENT PUBLICATIONS

OF THE

DEPARTMENT OF ANTHROPOLOGY

No. 6. Anthropological Papers.

No. 7. THE PURUMS : An Old Kuki Tribe of Manipur by T. C. Das, M.A.

No. 8. REPORT ON SANTALS by K. P. Chattopadhyay, M.Sc. (Cantab.).

No. 9. REPORT ON MUNICIPAL LABOUR IN CALCUTTA by K. P. Chattopadhyay, M.Sc. (Cantab.) and G. S. Ray, M.Sc.

No. 10. EXCAVATIONS IN MAYURBHANJ by N. K. Bose, M.Sc. and D. Sen, M.Sc.